ENVIRONMENTAL ASSESSMENT

KNOWLEDGE CORRIDOR – RESTORE VERMONTER
SPRINGFIELD TO EAST NORTHFIELD, MASSACHUSETTS

Prepared Pursuant to 42 USC § 4332, 49 USC § 303, and 64 FR 28545

by the

Massachusetts Executive Office of Transportation and Public Works

Date of Approval for Federal Railroad Administration

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1.0 PURPOSE AND NEED

1.1 Introduction

The Massachusetts Executive Office of Transportation and Public Works (EOT), in conjunction with the Pioneer Valley Planning Commission (PVPC); Vermont Agency of Transportation (VTrans); Pan Am Southern Railroad (PAS); and Amtrak, is considering potential improvements in passenger rail service in the I-91 Knowledge Corridor between Springfield and East Northfield in Massachusetts. Amtrak currently operates a passenger train, known as the Vermonter, providing daily roundtrip service between St. Albans, Vermont and Washington, D.C, which passes through the Knowledge Corridor.

The Proposed Project is to restore Amtrak's intercity passenger train service to its original route by relocating the Vermonter from the New England Central Railroad back to its former route on the Pan Am Southern Railroad (see **Figure 1-1**). The routing of Amtrak service in Vermont and south of Springfield would remain unchanged. The Pan Am Southern Rail route provides a shorter and more direct route for the Vermonter between Springfield and East Northfield, and improves access to densely populated areas along the Connecticut River. The Pan Am Southern Rail route would include station stops at the former Amtrak station at Northampton and the new intermodal station at Greenfield.

The Project would require improvements to the existing Pan Am Southern rail line, including crosstie replacement, rail replacement, rehabilitation of grade crossings, reactivation of passing sidings and portions of double track, upgrading of switches, improvements to signal and communications systems, surfacing and alignment of track, and improvements to bridges and station platforms. These improvements would facilitate the relocation of the Vermonter by improving safety, increasing operating speeds for existing freight train traffic and the Vermonter, and enhancing capacity on

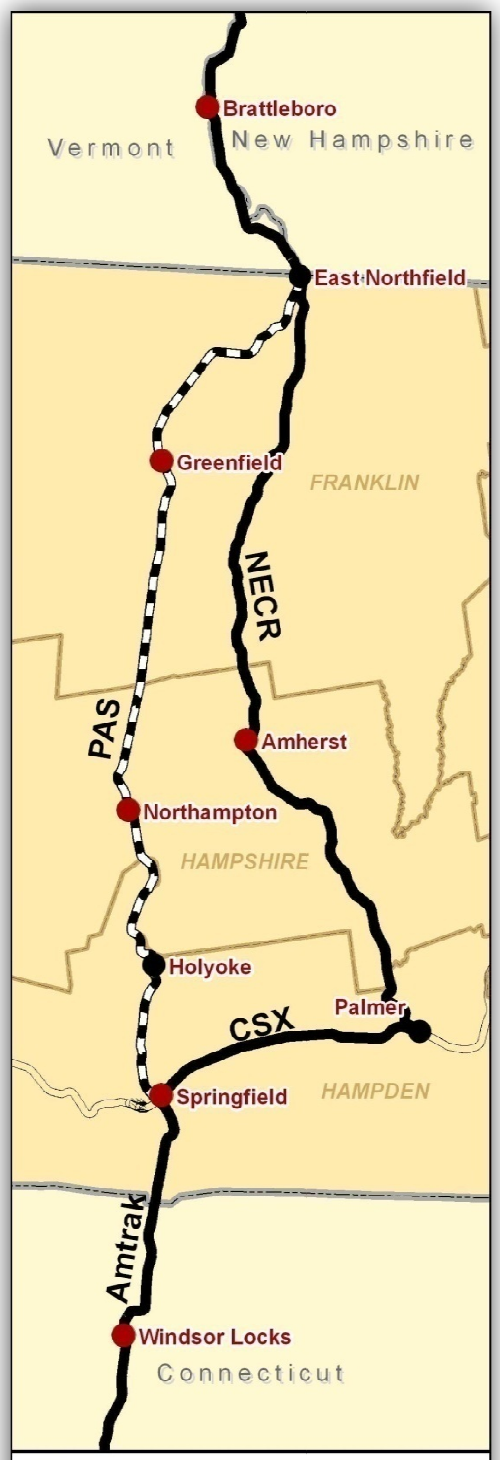


Figure 1-1 Current and Proposed Routes

the rail line to accommodate future increased levels of train traffic.

This Project facilitates the expansion of passenger rail service in the Knowledge Corridor by providing greater access to population centers and providing capacity for potential additional train frequencies and increased speeds. In addition, additional stations could be added to provide greater passenger access in communities served by the restored Vermonter route.

Expansion of rail services along the Knowledge Corridor is anticipated to provide economic revitalization and investment in communities with stations and the region, reduce pollutants associated with automobile travel, and reduce traffic and congestion.

1.2 Project Area

The project area consists of the Knowledge Corridor in Massachusetts, between Springfield and East Northfield. The Knowledge Corridor is traversed north-south by I-91 and the Connecticut River, as well as by the NECR and PAS rail lines. Major communities include Springfield, Holyoke, Northampton, Amherst, Greenfield, and Northfield. The project area includes portions of Franklin, Hampton, and Hampshire Counties.

1.3 Project History

The Connecticut River Valley has long served as a connection between New York and Eastern Canada and as a critical north-south transportation corridor for New England. Some of the earliest north-south railroads in North America connected the cities and towns along the Connecticut River and provided the first rail links between Boston, New York, and Montreal.

The rail corridor that developed along the Connecticut River was a primary transportation mode for both passengers and freight service well into the last century. Different segments of the rail corridor were constructed and owned by different railroad companies and that condition remains today (PVPC, 2009). From the south, the 62 mile long rail segment between New Haven CT, Hartford CT, and Springfield MA, was originally the New Haven Railroad and is currently owned and operated by Amtrak as the Springfield Line. The 49 mile long segment between Springfield and East Northfield, VT is the former Boston and Maine and is now Pan Am Railway's Conn River Line. The final 70 mile section between East Northfield, VT and White River Junction, VT is owned by New England Central Railroad and has trackage in both Vermont and New Hampshire.

The Knowledge Corridor is the label given the area between Springfield, Massachusetts and White River Junction, Vermont. The Knowledge Corridor, running north-south along Interstate 91 and the Connecticut River Valley, consists of high-density communities in addition to a multitude of important cultural, educational, business, and medical facilities. It is an important cultural and economic backbone for New England.

In 2008, the PVPC, with support from VTrans and EOT, began studying possible future passenger rail options to improve speed, maximize access, and provide viable transportation alternatives within the

Knowledge Corridor. The PVPC study objectives were to improve mobility and spark economic development (PVPC, 2009).

Three major rail service options were included in the study:

- Return Amtrak service to the Connecticut River Line between Springfield and East Northampton;
- Evaluate Commuter Rail Options for the line between Springfield and points north; and
- Evaluate intercity travel options.

The PVPC study area extends from New Haven, Connecticut, to St. Albans, Vermont, with a primary focus on the existing rail corridor between Springfield, Massachusetts and White River Junction, Vermont.

Amtrak initially operated nighttime passenger rail service (known as the Montrealer) from Springfield north through Holyoke, Northampton, and Greenfield on the Boston and Maine Railroad line, continuing to Montreal, Canada. Poor track conditions on the Boston and Maine line led to Amtrak's suspension of passenger service on that route in April 1987. Amtrak's Montrealer service was relocated to the existing freight rail tracks operated by Central Vermont Railroad (CVR) through Amherst and the Montrealer service was re-established in July 1989. In February 1995, the rail company RailTex purchased CVR and renamed the property New England Central Railroad (NECR). Shortly after this purchase, the nighttime Montrealer service became the "Vermonter" daytime operation from Washington, D.C., to St. Albans, Vermont. The State of Vermont subsidizes operation of the Vermonter.

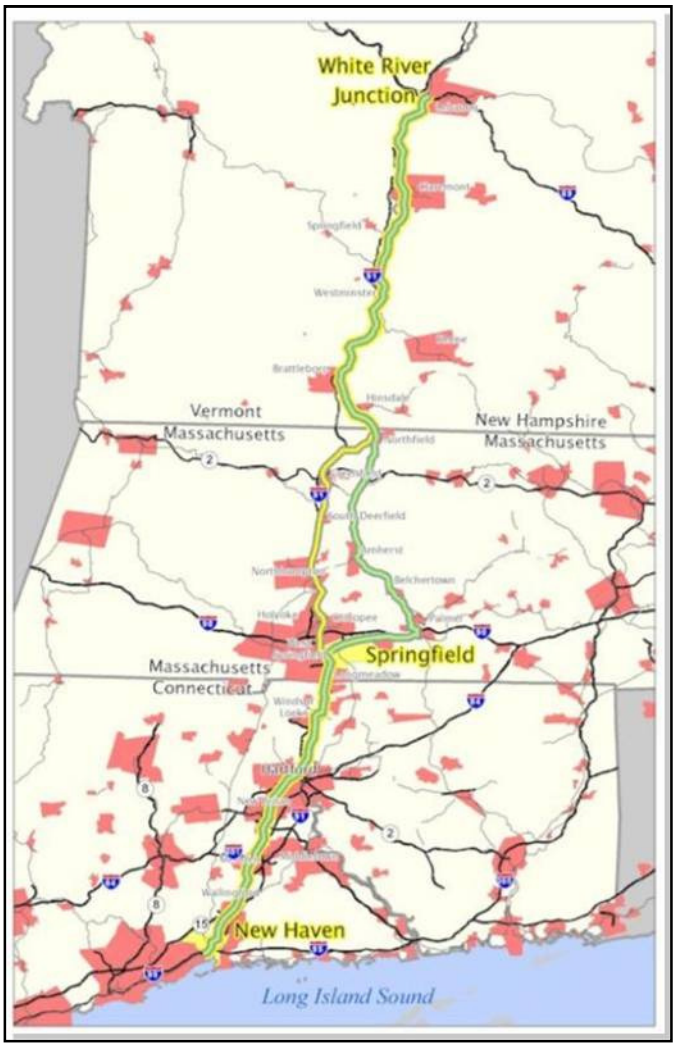


Figure 1-2 Existing Vermonter Route Map

Amtrak's Vermonter service currently makes one trip daily in each direction between St. Albans and Washington, D.C. The Vermonter stops in Springfield and Amherst, Massachusetts once per day in each direction (Franklin Regional Transportation Plan, 2007). The Vermonter currently travels through New Haven to Springfield, then travels east on the CSX Railroad Boston line to Palmer, where it makes a cumbersome reverse movement to gain access to the NECR line, and then north on the NECR through Amherst to East Northfield and into Vermont (see **Figure 1-2**).

1.4 Project Purpose and Need

The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service from Springfield, Massachusetts, north into Vermont. Factors that enhance viability and long-term sustainability of passenger rail service include:

- Increasing access to passenger rail service,
- Reducing travel time,
- Increasing revenue per train and/or reducing train operation costs,
- Increasing ridership per train, and
- Enhancing system capacity for future service improvements.

There is a need to reduce congestion and enhance safety on the I-91 highway corridor in Massachusetts, which experienced an estimated 22 percent increase in highway traffic volume between 1994 and 2004. Average daily traffic and vehicle miles travelled are expected to steadily increase through 2030. Currently, I-91 faces daily congestion backups at the Connecticut state line despite investments in new capacity, such as a dedicated High Occupancy Vehicle (HOV) lane (PVPC RTP, 2007). As traffic congestion on I-91 increases, it will become necessary to explore the use of intercity rail as an alternative mode of transportation.

The need for improved intercity passenger rail service is further demonstrated by the recent Increase in ridership on the Vermonter due to rising gas prices and increasing congestion on I-91. The annual ridership in 2008 was estimated to be 72,655.

The State of Vermont currently subsidizes the Amtrak Vermonter. Each year the cost for service has increased. In 2008, Vermont subsidized over 4 million dollars for Amtrak Vermonter. There is a need to minimize the cost for the subsidy of the Vermonter to maintain the ability of Vermont to continue to subsidize the train. Increasing ridership per train north of Springfield would reduce the subsidy per train and enhance the viability of continued passenger rail service in this corridor. Thus to maintain the long-term support of the required subsidy of the Vermonter it is important to seek means to minimize operating cost and increase revenue per train.

Improving the viability and long-term sustainability of passenger rail service from Springfield, Massachusetts, north into Vermont would also enhance economic growth in the region. The Knowledge Corridor connects many areas that are currently experiencing limited or even negative economic growth. There is a defined need to provide economic stimulus by improving transportation options for both passengers and rail freight. Moreover, economic analysis indicates that the municipalities within the study area have suitable physical infrastructure for further development but have lacked a true catalyst to accelerate growth. The two cities proposed for station development, Northampton and Greenfield, already have a downtown infrastructure suitable to transit-oriented development. Economic forecasts also indicate potential for using Springfield as a hub to further increase commuting and traveling opportunities to and from the study area. These characteristics include dense development patterns, historically active downtown centers, and nearby mixed-use development.

Reestablishment of passenger rail in the Knowledge Corridor is expected to generate induced economic development and could potentially result in 5,500 jobs and a population increase of 13,400 for the Pioneer Valley by 2030 (PVPC, 2009).

1.5 Decisions to be Made

Project activities and analysis will be conducted in compliance with National Environmental Policy Act (NEPA) and provisions of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). The purpose of this document is to provide government agencies and the public with full accounting of potential impacts to the natural, social, economic, and cultural environments. This document serves as the primary document to facilitate review of the alternatives developed to meet the project purpose and need.

Potential alternatives for consideration include a No-Action Alternative and an Action Alternative.

1.5.1 No-Action (No-build) Alternative

The No-Action or No-build alternative consists of the continued operation of the current Amtrak route, with the present level of maintenance. There would be no major changes to the current track configuration or operating conditions. Amtrak would continue to operate the Vermonter on the CSX Boston line between Springfield and Palmer, conduct a reverse movement at Palmer to transition onto the NECR line, and then on the NECR line from Palmer to East Northfield, with a single station at Amherst.

1.5.2 Action (Proposed Project) Alternative

The Action Alternative, referred to as the Proposed Project or Project, would return Amtrak service to the PAS Connecticut River Line between Springfield and East Northfield. Stations would be provided at the existing Amtrak station in Northampton and a new intermodal station in Greenfield. The Vermonter would continue to provide daily roundtrip service between St. Alban's, Vermont and Washington D.C. The Proposed Project would also include physical improvements to the Connecticut River Line, including crosstie replacement, rail replacement, rehabilitation of grade crossings, reactivation of passing sidings and portions of double track, upgrading of switches, improvements to signal and communications systems, surfacing and alignment of track, and improvements to bridges and station platforms.

In addition, the proposed project would facilitate the expansion of passenger rail service in the I-91 Knowledge Corridor, including provisions for increased speeds and future increased train frequencies. Expansion of rail services along the Knowledge Corridor is anticipated to provide economic revitalization, reduce pollutants associated with automobile travel, and reduce traffic and congestion.

Higher population densities in the project area (see **Figure 1-3**) primarily occur in the communities along I-91 and the Connecticut River. The existing Amtrak route largely avoids these communities by tracking east on the CSX Boston line to Palmer and then north on the NECR. The only community directly served is Amherst. Relocating Amtrak's passenger service to the PAS Connecticut River line and providing stations at Northampton and Greenfield as proposed would improve access to passenger rail service by serving areas with larger population densities (see **Figure 1-4**). The potential future addition of a station at Holyoke could further enhance access (a station at Holyoke is not included within this project).

Reducing travel time on the Vermonter improves its desirability as a transportation mode. A faster passenger rail service will increase ridership as more people take the train over congested highways. Current train service speeds are limited by congested rail lines, poor track configurations, and an unnecessary additional train movement east from Springfield before turning north. The existing Vermonter service traverses the congested CSX Boston line from Springfield to Palmer. This is heavily-traveled, east-west freight mainline, with limited capacity for adding additional trains. Trains connecting between the CSX line and the NECR line at Palmer must stop and make a reverse movement, causing delays in service. The total trip between Springfield and East Northfield is 60.4 miles. Relocating the Vermonter onto the PAS Connecticut River line between Springfield and East Northfield reduces the trip length by 11 miles plus it eliminates unnecessary east movement along the CSX Boston line, and the reverse movement at Palmer. These changes in operations are estimated to reduce travel time by 23 to 26 minutes between Springfield and East Northfield, thereby increasing ridership and meeting the purpose and need.

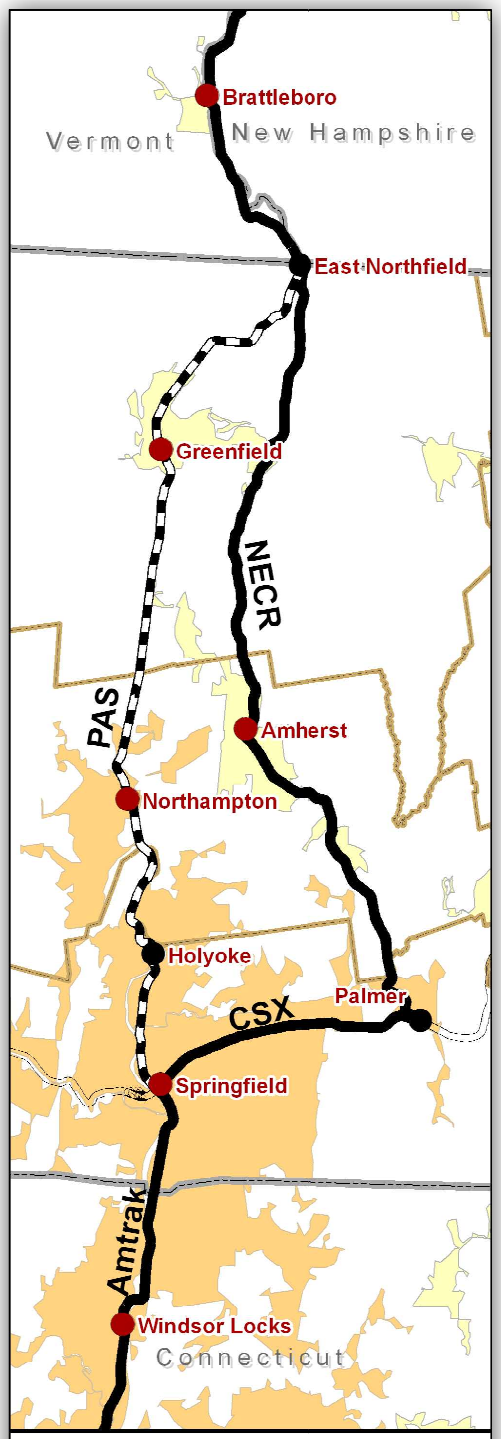


Figure 1-3 Population Density

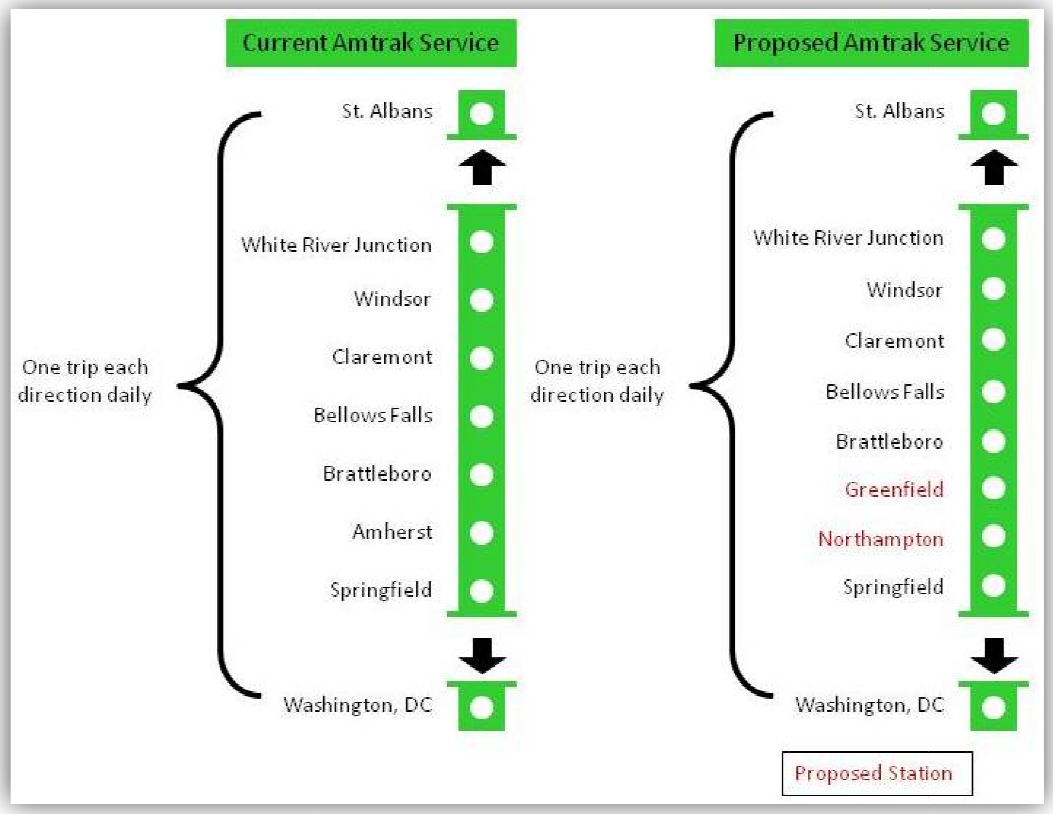


Figure 1.4 Service Depiction

1.6 Connected Actions

The Pioneer Valley Planning Commission identifies three related rail improvement projects within the Knowledge Corridor.

Boston-Springfield-Hartford High Speed Rail Corridor Feasibility Study: This study evaluates the feasibility of High Speed Rail between Boston, Springfield, and Hartford Haven. This study will look at reestablishing connectivity and providing better transportation access to the Boston metro area and promoting economic development in Springfield and Western Massachusetts. Funding for this effort was established in the Federal Appropriations bill in FY2005 and the study is expected to begin in the fall of 2009.

Union Station Revitalization: The 1926 train station in downtown Springfield, Union Station, and the surrounding areas are the subject of an ongoing renovation and revitalization plan. The development site is located in the downtown (north blocks) area and involves the restoration of Union Station located on Frank B. Murray Street and the development of an abutting vacant lot on Main Street. After revitalization is complete, Union Station would again become the Springfield station for Intercity Passenger Service (Amtrak), as well as the terminus for new commuter rail service.

DMU Equipment for Vermonter Line: VTrans has considered replacing Vermonter equipment, currently push/pull coaches with a diesel locomotive, with Diesel Multiple Units (DMUs) which could potentially reduce operating costs and allow for additional frequency of service on the line. DMUs do not have locomotives but instead smaller diesel engines in each car, so train length can be easily varied based on passenger demand.

1.7 Applicable Regulations and Permits

The following statutes and orders apply to the proposed action and were considered during the preparation of this document:

- Endangered Species Act, as regulated at 50 CFR 17
- Public Law 91-190, National Environmental Policy Act of 1969, 42 USC § 4321 et seq., signed January 1, 1970
- Public Law 95-217, Clean Water Act of 1977, 33 USC § 1251-1376
- Sections 9 and 10 of the Rivers and Harbors Act of 1899, 33 USC 401
- Section 106 of the National Historic Preservation Act of 1966, as amended, 16 USC 470
- Section 4(f) of the U.S. Department of Transportation Act of 1966, 49 USC 303
- Section 404 of the Federal Water Pollution Control Act (CWA)
- Section 6(f) of the Land and Water Conservation Act of 1965, 16 USC 460
- Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, 42 USC 61
- Executive Order 11988, Floodplain Management, 42 FR 26951, signed May 24, 1977
- Executive Order 11990, Protection of Wetlands, 42 FR 26961, signed May 24, 1977
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, 59 FR 7629, signed February 11, 1994
- Noise Control Act of 1972 (42 U.S.C. 4901 et seq.)
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, 65 FR 50121, signed August 11, 2000
- Federal Railroad Administration Procedures for Considering Environmental Impacts, 64 FR 28545 (May 26, 1999) and 49 CFR Part 260.35
- Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, 40 CFR parts 1500-1508, November 29, 1978
- National Emission Standards for Hazardous Air Pollutants (NESHAP) 40 CFR 61 and 40 CFR 63

- Federal Register, Use of Locomotive Horns at Highway-Rail Grade Crossings; Final Rule, 49 CFR parts 222 and 229, April 27, 2005
- Massachusetts Department of Environmental Protection, Wetlands Protection Act Regulations and Massachusetts Rivers Protection Act as Amended, 310 CMR 10.00
- Massachusetts Surface Water Permit Discharge Program, 314 CMR 3.00 and 4.00
- Massachusetts Noise Regulations, 310 CMR 7.10
- Massachusetts Endangered Species Act; 321 CMR 10:00
- Massachusetts Hazardous Waste Regulations, 310 CMR 30.000
- Massachusetts Environmental Policy Act (MEPA), 310 CMR 11.00

The need for permits associated with the Proposed Project would be determined by applicable federal, state and local permitting agencies.

2.0 ALTERNATIVES

2.1 Introduction

The Massachusetts Executive Office of Transportation and Public Works (EOT) consulted with various municipalities and public stakeholders during the identification and evaluation of alternatives. Project alternatives were evaluated for their ability to meet project purpose and need, meet engineering design criteria, and avoid or reduce adverse impacts to the physical, biological, and human environment. Three alternatives were identified and evaluated; one was dismissed, and two were retained for detailed evaluation: the No-Action Alternative and the Proposed Project Alternative.

2.2 No-Action Alternative

The No-Action Alternative consists of the continued operation of the current Amtrak route, with the present level of maintenance and no major changes to the current track configuration or operating conditions. There would continue to be a daily train traveling north and south between Washington, D.C., and St. Albans, Vermont. Amtrak passenger service between Springfield and East Northfield, Massachusetts, would continue to travel from Springfield to Palmer on the congested CSX mainline. Trains would conduct a reverse movement at Palmer to switch between the CSX railway and the NECR line. The Amtrak service would travel from Palmer on the NECR through Amherst to East Northfield and into Vermont. The route is 60.4 miles long, with a train speed of 55 mph.

The No-Action Alternative would not meet the project purpose and need because it would not enhance the viability of passenger rail service in the Knowledge Corridor from Springfield, Massachusetts, north into Vermont. The No-Action Alternative does not increase access to passenger rail service, reduce travel time, increase ridership per train, or provide for future rail service expansion.

The No-Action Alternative was retained for further analysis to provide a comparison to the Proposed Project and to help decision-makers and public stakeholders understand the impacts of taking no action.

2.3 Proposed Project Alternative

The Proposed Project, or Preferred Alternative, would relocate the Amtrak intercity passenger train, known as the Vermonter, from the New England Central Railroad back to its former route on the Pan Am Southern Railroad between Springfield and East Northfield in Massachusetts. It is anticipated that initial service would include station stops at the former Amtrak station at Northampton and the new intermodal station at Greenfield. The proposed route affords the opportunity for establishing additional stations in the future. One potential future station location is in Holyoke.

The project would include improvements to the existing Pan Am Southern rail line, including crosstie replacement, rail replacement, rehabilitation of grade crossings, reactivation of passing sidings and portions of double track, upgrading of switches, improvements to signal and communications systems, surfacing and alignment of track, and improvements to bridges and station platforms.

The Project improvements would occur within the existing right-of-way owned by the Pan Am Southern. The Project does not involve any acquisition of additional right-of-way.

The Proposed Project does not involve any additional ballast or fill material to be placed beyond the existing limits of ballast or fill. As such, there would be no culvert repair or replacement. There will be no in-water work in federal or state regulated wetlands or waterways.

The Project does not involve clearing or grading activity.

2.3.1 Rail & Track Upgrades

- The existing jointed rail would be replaced with new continuous welded rail for 49 miles of track.
- All new rail on passing sidings and double track would be welded.
- Crossties would be replaced as necessary.
- Switch upgrade at MP 45.5.

2.3.2 Reactivation of Passing Sidings and Double Track

Several sections where passing sidings and portions of double track existed would be reactivated. These sidings and double track sections would be newly constructed on existing ballast. There would be no new ballast or fill placed beyond the existing limits of ballast or fill. Reactivation of passing sidings and portions of double track would occur at:

- ~ MP 0 – 1.6, siding east side of mainline.
- ~ MP 6.8 – 7.26, siding east side of mainline.
- ~ MP 13.5 – 14.15, siding east side of mainline.
- ~ MP 15.2 – 16, siding west side of mainline.

- ~ MP 27.7 – 29.2, siding west side of mainline.
- ~ MP 32.6 – 36.6, double track section west side of mainline.

2.3.3 Grade Crossing Upgrades

- All at-grade highway/rail crossings will be improved, to include provision of an active warning device. The active warning device will consist of either flashing lights or flashing lights and crossing barriers. The specific warning device for each grade crossing will be determined in coordination with Massachusetts Department of Public Utility during project final design.

2.3.4 Signal and Communication System Upgrades

- Signal rehabilitation will be made to support the operations plan. Improvements include restoring the signal system north of Greenfield and adding 5 interlockings.

2.3.5 Bridge Improvements

- Bridges will be inspected and repaired as necessary, possibly including replacement of rails, crossties, and other minor components. Bridge repair will not require in-water work or alteration of the bridge's key structural components.

2.3.6 Station/Platforms

- Stations will be sited to optimize service of the community and fit current and future land use plans of the local communities.
- Platforms will be designed to ensure compliance with the Americans with Disabilities Act (ADA) and applicable state and federal regulations for railroad stations and platform facilities.

Northampton

- The Northampton Station would be located at current station location off of Railroad Avenue. (This station was used to provide Amtrak passenger rail service for the Montrealer.)
- The station would utilize the existing station structure and parking facilities.
- The existing station platform would be upgraded to facilitate safe and efficient boarding of trains.

Greenfield

- The Greenfield Station would be constructed as part of the future inter-modal hub located at the former Toyota Center.
- Station-goers will utilize current parking facilities associated with Bank Row and Garden Cinema adjacent to proposed station.
- Station location would be integrated with redevelopment of Bank Row area on Olive Street.

2.3.7 Applicable Permits and Agency Coordination

The Proposed Project will require the following permits and/or agency coordination prior to construction:

- The Massachusetts Wetlands Protection Act (M.G.L. c.131 § 40) (WPA) and implementing regulations (310 CMR 10.00) is a state statute administered locally by the municipal Conservation Commission. The WPA requires the preparation of a Notice of Intent (NOI) for work within a wetland resource area or for work within 100 feet of certain wetland resource areas (i.e., the 100-foot Buffer Zone). Portions of Project activities will likely be located within the WPA buffer zone to wetland resource areas and within previously disturbed Riverfront Areas. A Notice of Intent filing with the applicable Conservation Commissions (Northfield, Bernardston, Greenfield, Deerfield, Whately, Hatfield, Northampton, Easthampton, Holyoke, Chicopee, and Springfield) will be required for activities located either within resource areas or within their applicable buffer zones.
- FRA will determine applicability of a Quiet Zone designation for the at-grade crossings where horn noise would create a severe impact during project final design.
- FRA must complete a formal consultation with Massachusetts Historical Commission [MHC] regarding the determination of no effect on historic resources and a de minimis use of a Section 4(f) resource.

2.4 Alternatives Considered But Eliminated from Detailed Analysis

2.4.1 Corridor Alternatives Considered But Eliminated from Detailed Analysis

An alternative that involved upgrading the existing route along the CSX and NECR lines was considered. This alternative would have involved similar track improvements to that proposed for the PAS line, including crosstie replacement, rail replacement, rehabilitation of grade crossings, upgrading of switches, improvements to signal and communications systems, surfacing and alignment of track, and improvements to bridges and the Amherst station platform. The alternative also includes a completely new bridge in Palmer crossing the Quaboag River to eliminate the reverse move in Palmer. These system upgrades would likely provide modest improvements to system performance and slightly reduce travel time. However, this alternative was dismissed from detailed analysis for the following reasons:

- The alternative would not provide a shorter route. The CSX/NECR route is 10 miles longer than the proposed PAS route.
- The alternative's continued reliance on the CSX segment between Springfield and Palmer restricts reliability and on-time performance due to congestion on the line. The CSX segment is part of the busiest section of freight railroad in New England, with more than 30 trains per day on a primarily single track railroad.
- The alternative is not anticipated to markedly increase ridership as travel time would not dramatically decrease.
- This alternative does not serve the urban centers of the Knowledge Corridor in comparison to the Proposed Project alternative which has 124,875 more people living within 5 miles of the station locations.

- The new bridge in Palmer would have adverse environmental impacts.

Further, due to the reliance on the congested CSX Boston line to move Amtrak trains from Springfield to Palmer this alternative places limitations on future passenger rail service expansion.

2.4.2 Station Site and Parking Alternatives Considered But Eliminated from Detailed Analysis

Greenfield

The former station stop, located adjacent to the Greenfield Energy Park on the western side of the Pan Am Railway's Conn River Line was analyzed as a potential station site for the Project. Analysis showed that the existing station consisted of a badly-crumbled remnant of the former platform. The existing wrought iron fencing around Energy Park appears to impose limitations on both platform width and the ability to construct station facilities. In addition, accessibility to this location is not optimal, as it is located at the end of a short side street off Main Street in the middle of downtown Greenfield. This site appeared to have very limited parking availability and potential. At present there are approximately 30 spaces of free public parking with little room to either expand this parking area, or to construct a station facility, without taking some of the currently available parking spaces. Therefore, this alternative station location was eliminated from detailed analysis.

Northampton

A station site located approximately the same distance from town center as the former Amtrak station site, but to the north, was analyzed for the Project. The city has plans to replace the existing Registry of Deeds and Probate with a new Justice Center. Behind that new Justice Center and adjacent to the Connecticut River Main Line would be a new parking structure, with the potential for a train station to be located on the second floor so that the platform would be at grade with the rail line. However, as the Justice Center Development is in the early planning phase, unknowns associated with the final development program and configuration and with the ultimate schedule for completion of that project make this a less desirable location for a station at the present time. Therefore, this alternative station location was eliminated from detailed analysis.

3.0 ENVIRONMENTAL CONSEQUENCES

This chapter provides an overview of the probable beneficial and adverse effects of the Proposed Project and the no action or No-Build Alternative on both the built environment and the natural environment.

A number of physical, biological and human resources were reviewed as part of this environmental review process. Information regarding the existing conditions of the resources within the study area was collected from a number of sources. Following collection of existing conditions information (also known as affected environment), analyses of the impacts of the two alternatives were performed. The impacts analyses generally overlay the Proposed Project and the No-Build Alternative upon the existing conditions findings. Based on this "overlay", potential impacts to the natural and built environment or elements of the study area are identified. For certain resources, more technical analyses are performed. The extent of these impacts is typically quantified, if appropriate. Mitigation measures – that is, ways in which impacts can be avoided or made less harmful – are also identified where warranted as part of this analysis.

The probable beneficial and adverse effects identified include direct and indirect effects, and cumulative impacts:

> **Direct effects** are caused by the action and occur at the same time and place (40 CFR §1508.8).
>
> **Indirect effects** are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (40 CFR §1508.8).
>
> **Cumulative impact** is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR §1508.7).

Several Technical Memoranda and other studies have been prepared to provide more detailed information in the areas of *Air Quality, Wetlands and Water Resources, Noise and Vibration, Rare Species, Economic Development, and Cultural Resources*. These materials are attached as **Appendices A – F** in this document.

The direct and indirect effects, and cumulative impacts expected from the Proposed Project and the No Build Alternative are described below. Direct and indirect effects are discussed by resource. Only those resources that have a reasonable likelihood to be affected by, or to affect, the Proposed Project, are addressed herein. Resources that would not be affected were not inventoried or analyzed within this document, and include:

> *Geology* – The Proposed Project would have no effect on geological resources; project construction does not require deep excavation or structural foundations.

Soils – The Proposed Project occurs within existing right-of-way. Construction of new track and support structures occurs largely on top of existing ballast. No additional soils are cleared or affected.

Farmlands – The Proposed Project occurs within existing right-of-way, and therefore would not affect farmlands.

Coastal Zone Management – The Proposed Project is not within the coastal zone.

Wildlife – The Proposed Project occurs within existing rail right-of-way that is already developed with rail infrastructure. The right-of-way provides almost no habitat for wildlife.

Vegetation – The Proposed Project occurs within existing rail right-of-way that is already developed with rail infrastructure. The right-of-way contains little vegetation.

Short-term temporary impacts associated with project construction activities are discussed separately, as are cumulative impacts. The Proposed Project is also compared with the No-Build Alternative.

3.1 Physical Environment

3.1.1 Air Quality

Since the project has the potential to affect air quality in the region, an analysis was performed to estimate impacts that might result from the proposed relocation of the Amtrak "Vermonter" line (see **Appendix A**). The analysis was performed to address the requirements set forth in both 40 CFR 93, with respect to Conformity, and 40 CFR 50, with respect to health-based air quality standards.

The air quality analysis focuses on the relocation of a single Amtrak P-42 locomotive from one existing rail line to another existing rail line. The relocation, combined with planned track improvements, will result in the train's traveling a shorter distance and at a higher average speed. This analysis quantitatively assesses the emissions changes resulting from the relocation and qualitatively assesses changes in the resulting pollutant concentrations that could be expected from these emissions.

No-Build Alternative

The No-Build Alternative would not affect air quality. The review of local air quality in the region confirms that the area is in attainment of ambient air quality standards for all pollutants except ozone. It is anticipated this would continue under the No-Build Alternative.

Proposed Project

The Proposed Project has beneficial effects on air quality and no adverse effects on air quality.

The Proposed Project will result in a decrease in air emissions due to the shorter distance of the proposed rail line and the increased speed at which the train will travel. The shorter distance and increased speed result in a significantly shorter time that the locomotives will be in use. Overall, emissions are expected to decrease approximately 28% due to the changes in speed and distance. Emissions of NOx are expected to decrease 9 tons per year (from 32 tpy to 23 tpy). Emissions of CO are expected to decrease 1.3 tons per year (from 4.9 tpy to 3.6 tpy). Emissions of all other criteria

pollutants, metals, and hazardous air pollutants are expected to decrease less than 1 tpy each. Due to the decrease in overall emissions of 28%, it can be expected that the overall air quality in the project's region would be improved.

Finally, the project is presumed to conform to the General and Transportation Conformity requirements as promulgated in 40 CFR 93. The proposed relocation area is in attainment of National Ambient Air Quality Standards (NAAQS) for all pollutants except ozone (Subpart 2/Moderate). Massachusetts is part of the ozone transport region. Since emissions from the Proposed Project are below all applicable *de minimis* thresholds, the project is exempt from the requirements of General Conformity.

3.1.2 Water Resources and Quality

The Proposed Project crosses two major rivers, the Connecticut River and the Deerfield River, as well as numerous named and unnamed waterways. The Connecticut River and Deerfield River are non-navigable waters in the project areas. In several locations along the railway route, the existing PAS Connecticut River Line is located adjacent to or over the Connecticut River and Deerfield River. An analysis of project effects on water resources was conducted, including a review of federal and state water quality and wetland regulations that could be applicable to the Project (see **Appendix B**).

Mapped protected drinking water supply areas adjacent to and within the existing railway corridor were reviewed. As shown in **Appendix B**, the existing PAS Connecticut River Line crosses through one Interim Wellhead Protection Area[1] in Northfield, two Massachusetts Departments of Environmental Protection (MassDEP) approved Zone II[2] Areas in Bernardston, one MassDEP approved Zone II Area in Greenfield, one Interim Wellhead Protection Area in Deerfield, and one MassDEP approved Zone II Area in both Whately and Hatfield.

No-Build Alternative

The No-Build Alternative would not impact water resources and water quality.

Proposed Project

The Proposed Project's change in service will not affect water resources. The physical improvements to the PAS Connecticut River Line will be within the existing right-of-way and within areas already covered with ballast, and do not include any in-water work, additional clearing, additional fill, or alteration of any drainage structure or waterway.

Project activities are not anticipated to impact the mapped drinking water supply areas nor to have an effect on water quality, as (1) proposed activities will not require increased water usage and will therefore not have an impact on water supply, (2) project activities will not change groundwater or surface water flows, (3) no new stormwater outfalls are proposed nor are modifications to existing

[1] Interim wellhead protection areas are identified for public water systems using wells or well fields that lack a MassDEP approved Zone II. The interim wellhead protection area is generally a one-half mile radius measured from the well or wellfield for sources whose approved pumping rates are 100,000 gallons per day (gpd) or greater. See 310 CMR 22.00 Massachusetts Drinking Water Regulations.

[2] Zone II is the area of an aquifer which contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated. It is bounded by the groundwater divides which result from pumping the well and by the contact of the aquifer with less permeable materials such as till or bedrock. See 310 CMR 22.00 Massachusetts Drinking Water Regulations.

outfalls or headwalls proposed, and (4) proposed activities will be located within the existing maintained right-of-way and will not change existing drainage patterns.

As Project activities will not require in-water work within the Connecticut River or Deerfield River, nor the need for new structures or modifications to existing structures over the Connecticut or Deerfield Rivers that might have the potential to impact the navigable capacity of the waterbodies, and all activities will be located within previously developed areas within the existing right-of-way, the Project should not be subject to a Section 10 filing under the Rivers and Harbors Act of 1899 or the General Bridge Act of 1946.

As the Project is not likely to alter greater than 1 acre of land by "clearing, grading, and excavating", coverage under the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) is not required. In the event that proposed activities do exceed the 1 acre threshold (described in **Appendix B**), a NPDES Stormwater Pollution Prevention Plan (SWPPP) will be prepared and a Notice of Intent will be filed in order to obtain coverage prior to Project construction.

3.1.3 Wetlands

Wetlands and other waterways are protected by federal and state regulatory programs against impacts. Freshwater wetlands and waterbodies are mapped adjacent to and within the existing railway right-of-way, which extends through 11 communities (see **Appendix B**). Wetland and waterbody types mapped include open waters, intermittent and perennial streams and rivers, marsh and meadow systems, shrub swamps, and wooded swamps. The railway crosses over two major river systems: the Connecticut River and the Deerfield River. The Project does not cross or abut coastal zones.

Section 404 of the U.S. Clean Water Act authorizes the U.S. Army Corps of Engineers (USACE) to issue permits, after notice and opportunity for public hearing, for the discharge of dredged or fill material into "waters of the United States"[3].

The Massachusetts Wetlands Protection Act (M.G.L. c.131 § 40) (WPA) and implementing regulations (310 CMR 10.00) is a state statute administered locally by the municipal Conservation Commission. The WPA requires the preparation of a Notice of Intent (NOI) for work within a wetland resource area or for work within 100 feet of certain wetland resource areas (i.e., the 100-foot Buffer Zone).

In 1996 the Massachusetts Legislature passed the Massachusetts Rivers Protection Act (Acts of 1996, Ch. 258). This law amends the WPA, and provides protection to rivers by regulating activities within a newly established wetland resource area known as the Riverfront Area. In most municipalities the Riverfront Area is 200 feet wide and is measured from each side of the river from the mean annual high water line outward horizontally and parallel to the river.

No-Build Alternative

The No-Build Alternative would not impact any wetlands or waterways.

[3] "Waters of the United States" is broadly defined in the federal regulations that implement the Clean Water Act. It includes tidal waters, rivers, streams, lakes, ponds and wetlands.

Proposed Project

Project activities will not result in any temporary or permanent impacts to wetlands, as Project activities will be located in previously developed areas located within the existing right-of-way. The Project does not involve placing any fill in wetlands or waterways, nor does it involve in-water work. As Project activities will not result in any temporary or permanent impacts to freshwater wetlands or waterways, a permit from the USACE under Section 404 is not required nor is water quality certification from the MassDEP.

As no impacts to wetlands are anticipated, the Project is not expected to impact the hydrology of adjacent wetlands and therefore will have no impact on water quality of the wetlands.

Portions of Project activities will likely be located within the WPA buffer zone to wetland resource areas and within previously disturbed Riverfront Areas. A Notice of Intent filing with the applicable Conservation Commissions (Northfield, Bernardston, Greenfield, Deerfield, Whately, Hatfield, Northampton, Easthampton, Holyoke, Chicopee, and Springfield) will be required for activities located either within resource areas or within their applicable buffer zones.

3.1.4 Floodplains

Federal protection of floodplains is mandated by Executive Order 11988, "Floodplain Management" and by implementation of federal regulations under 44 CFR 9.00. These regulations direct federal agencies to undertake actions to avoid impacts on floodplain areas. The Federal Emergency Management Agency (FEMA) has primary responsibility for identifying flood-prone areas.

There are FEMA designated floodplains in the project area. According to the Massachusetts GIS database, the existing PAS Connecticut River Line crosses over areas of the 100-year floodplain (see **Appendix B**).

No-Build Alternative

The No-Build Alternative would not create new impacts to 100-year floodplains.

Proposed Project

The Proposed Project's physical changes do not include any additional fill material within waterways or floodplains, and therefore do not impact 100-year floodplains. The proposed station improvements at Northampton and Greenfield are not within the 100-year floodplain.

3.1.5 Noise and Vibration

The proposed project has potential to change noise and vibration emissions from trains in the project area. The project would relocate the Vermonter to the PAS Connecticut River Line, thus adding one train northbound and one train southbound to the rail line daily. The project would also include various physical improvements to the rail line, allowing both the existing freight rail traffic and the new passenger trains to operate at faster speeds. One of the physical improvements, replacing the existing jointed rail with welded rail along the 49-mile corridor, would substantially reduce train wayside noise caused by wheels.

Noise and vibration analyses were performed using guidelines published by the Federal Transit Administration (FTA). The FTA guidelines address noise and vibration from both passenger rail and freight rail operations, and are the accepted standard for train noise. The analyses evaluated noise and vibration from trains under existing and future conditions (see **Appendix C**).

Train noise is a combination of horn noise and wayside noise. Horn noise comes from locomotive horns. Horns are required safety equipment and must be blown at certain at-grade crossings to warn motorists and pedestrians. Wayside noise is the noise the train makes in passing along the track. Wayside noise is louder with older jointed rails, such as are in use at the existing PAS Connecticut River Line. Modern rail systems use welded rail, which reduces wayside noise.

Vibration as it relates to railway movements is generally caused by uneven interactions between the wheels of the train and the railway surfaces. Examples of this include wheels rolling over rail joints and flat spots on wheels that are not true. These uneven interactions result in vibration that travels through the adjacent ground. This vibration can range from barely perceptible to very disruptive.

No-Build Alternative

The No-Build Alternative would not create additional noise impacts. The existing noise and vibration conditions on both the PAS Connecticut River Line and the current Vermonter route (CSX Boston line from Springfield to Palmer and NERC line from Palmer to East Northfield) would remain unchanged. Under the existing conditions on the PAS Connecticut River Line, freight trains travel at 10 mph on jointed track.

Proposed Project

Airborne Noise Assessment - The project team performed a Noise Screening Assessment and a General Noise Assessment in accordance with FTA guidelines to assess project-related airborne noise (see **Appendix C**). The FTA guidelines compare categories of land use against increases in noise exposure levels to identify impacts. The FTA methodology classifies land uses into three categories based on their sensitivity to noise. Each of these three land use categories has a corresponding noise impact threshold. Impact thresholds are categorized into two categories: moderate impacts and severe impacts. Moderate impacts are described as noise level increases that are recognizable but not great enough to cause adverse reactions from the community. Severe impacts are described as noise level impacts where a significant percentage of people would be highly annoyed by the new noise.

For the purpose of the General Noise Assessment, the PAS Connecticut River Line was separated into nine segments. The nine segments were selected to represent a range of existing noise conditions throughout the corridor. Six of the segments include the urban areas along the right-of-way. Two segments are areas where roadways are very near the rail right-of-way and their noise is assumed to dominate the ambient acoustic environment. The final segment consists of all the remaining areas, mostly rural, not included in the other segments.

Table 3.1.5-1 presents the number of receptors meeting the FTA criteria for noise impacts per project segment. The table shows analysis results including severe and moderate noise impacts for each of the three land use categories used by FTA.

Table 3.1.5-1 Noise Impacts

Project Segment	FTA Land Use Category	Number of receptors meeting FTA criteria for noise impacts	
		Severe Impact	**Moderate Impact**
Greenfield	Category 1	0	0
	Category 2	0	44
	Category 3	0	3
Deerfield	Category 1	0	0
	Category 2	0	4
	Category 3	0	2
South Deerfield	Category 1	0	0
	Category 2	0	14
	Category 3	0	0
Northampton	Category 1	0	0
	Category 2	0	30
	Category 3	0	1
Holyoke	Category 1	0	0
	Category 2	0	21
	Category 3	0	1
Springfield Area	Category 1	0	0
	Category 2	0	1
	Category 3	0	5
Northampton Road	Category 1	0	0
	Category 2	0	22
	Category 3	0	1
Mt. Hermon Station Road	Category 1	0	0
	Category 2	1	4
	Category 3	0	0
Rural	Category 1	0	0
	Category 2	1	49
	Category 3	0	1
Total		**2**	**203**

Analysis results project a total of 205 noise receptors with noise levels meeting FTA criteria for impacts due to the proposed project: 203 moderate noise impacts and 2 severe noise impacts. Both of the

severe impacts result from horn noise where a Category 2 receptor lies very near an at-grade highway/rail crossing. Of the moderate impacts, 14 were impacts to Category 3 receptors and the remaining 189 were to Category 2 receptors. Based on the linear extent of the proposed project, and the number of urban areas it passes through, the number of moderate noise impacts is not unusual. There are no impacts to Category 1 receptors. **Figure 3** in **Appendix C** shows the locations where noise impacts are predicted to occur.

Vibration Assessment - A Screening Vibration Assessment and General Vibration Assessment were prepared in accordance with FTA guidelines "*Transit Noise and Vibration Impact Assessment*" (May 2006) to estimate the number of potential ground-borne vibration impacts created by the Proposed Project (see **Appendix C**). A Screening Vibration Assessment was performed to determine if any vibration-sensitive land uses exist within FTA's fixed, default vibration screening distances. Results of the screening assessment confirmed the presence of vibration-sensitive land uses within FTA's screening distances; therefore a General Vibration Assessment was performed. The General Vibration Assessment methods were used to evaluate vibration from existing freight, and future freight and passenger trains in the project corridor. Under existing conditions on the PAS Connecticut River Line, freight trains travel at 10 mph on jointed track. The Proposed Project will result in freight trains traveling at 40 miles per hour (mph) and a passenger train moving at 60 mph, both on welded track.

The FTA recognizes three land use categories for assessing general vibration impacts.

- **Land Use Category 1 – High Vibration Sensitivity:** This category includes buildings where low ambient vibration is essential for operations within the building that may be well below levels associated with human annoyance. Typical Category 1 land uses include vibration-sensitive research and manufacturing facilities, hospitals, and university research operations. Category 1 also includes special land uses, such as concert halls, television and recording studios, and theaters, which can be very sensitive to vibration and ground-borne noise. The FTA has developed special vibration levels for these land uses.
- **Land Use Category 2 – Residential:** This category includes all residential land uses and any building where people sleep, such as hotels and hospitals.
- **Land Use Category 3 – Institutional:** This category includes schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment, but still have the potential for activity interference.

Table 3.1.5-2 summarizes the potential vibration impacts associated with the proposed project. **Figure 3** in **Appendix C** shows the locations where ground-borne vibration impacts are predicted to occur.

Table 3.1.5-2 Potential Vibration Impacts

Land Use Category	Number of Receptors meeting FTA Criteria for Vibration Impacts	
	10 mph Freight Scenario (Current Conditions)	60 mph Passenger Scenario (Proposed Project Conditions)
Category 1	0	0
Category 2	0	98
Category 3	0	2
Special Buildings	0 @ 65 VdB* 0 @ 80 VdB	1 @ 65 VdB 0 @ 80 VdB

*VdB = vibration decibels (VdB), a measure of the strength of the vibration per FTA and FRA (see **Appendix C**).

As **Table 3.1.5-2** indicates, the existing 10 mph freight train on jointed track is predicted to result in no ground-borne vibration impacts. The 60 mph passenger train on welded track would potentially affect ninety-eight (98) receptors in Category 2, two (2) receptors in Category 3 and affect one (1) Special Building (a TV studio). Although Category 1 land uses were identified during this assessment, none fall within the distance to calculated vibration impact threshold.

Based on the limited number of train pass-by events under the Proposed Project, the potential vibration impacts at Category 2 and Category 3 land uses are considered acceptable under FTA guidance. The potential vibration impact at the television broadcast studio can be mitigated by installing track-based mitigation measures like resilient track fasteners or resilient ballast mats. Additionally, a Detailed Vibration Assessment could be performed during final design to identify the most appropriate track-based mitigation measure.

Noise and Vibration Benefit – The Proposed Project includes two noise and vibration benefits. First, the project would improve the existing PAS Connecticut River Line by replacing the existing 49 miles of jointed rail with welded rail, resulting in less wheel noise. Second, there would also be a noise and vibration reduction along the existing Vermonter route. Moving the Vermonter off of the existing route from Springfield to Palmer (CSX rail line) and Palmer to East Northfield (NECR rail line) would reduce the daily train traffic by one train each way, thereby reducing noise and vibration to local receptors. Noise and vibration analyses described in this environmental assessment do not quantify the benefit to receptors along the current route of relocating the passenger service to a different project corridor, yet the benefit is recognized to occur.

Mitigation – The Proposed Project will create increases in train noise levels for some receptors that exceed FTA thresholds for noise impacts; two receptors will experience noise level increases that exceed the threshold for a severe impact.

The two noise level increases that exceed the threshold for a severe impact will occur near highway/rail-at-grade crossings where locomotive horns are used. For these two impacts, quiet zones were considered as a potential mitigation measure. The FRA issued the Final Rule on the Use of Locomotive

Horns at Highway-Rail Grade Crossings in June 2005. This Rule states that a train crew must sound the locomotive's horn when approaching a grade crossing. In addition to requiring that train horns must be sounded, the FRA Rule provides a methodology for establishing, maintaining, and enforcing "Quiet Zones". Quiet Zones are areas of at least one-half mile of track where locomotive horn use is prohibited and alternative safety measures are implemented to preserve public safety, although train crews are still permitted to sound the horn within a Quiet Zone for railroad-related reasons or for safety reasons. Quiet Zones are regulated by FRA, and municipalities are responsible for coordinating their creation with FRA and other agencies in accordance with FRA rules. Mitigation for the Proposed Action may include the use of supplemental and/or alternate safety measures at grade crossings in proximity to the two receptors with severe impacts in order to qualify for a Quiet Zone. The applicability of such safety measures and a Quiet Zone designation for the at-grade crossings where horn noise would create a severe impact would be determined during project final design.

Train noise impacts predicted to occur in areas outside of highway/rail at-grade crossings have fewer options for mitigation. Noise walls can provide shielding and reduce train noise levels to rows of homes immediately adjacent to the project area. Typically noise walls are only effective at shielding the first row of homes. To be effective, noise walls must be continuous (no openings or breaks) and must extend past the first and last receiver in the row of homes adjacent to the rail line.

The project area was reviewed to determine if noise walls could provide adequate shielding and reduce train noise levels at receptors predicted to experience train noise impacts under the proposed project. Results of that review concluded that noise walls would not be effective at reducing train noise levels in the project area. Many of the receptors anticipated to receive noise levels that exceed FTA criteria for moderate impacts are isolated, without other impacted receptors close by. Constructing a noise wall for a single receptor is not practical. There are some small groupings of noise receptors anticipated to receive noise levels that exceed FTA criteria in Greenfield and Holyoke. However, the presence of nearby highway/rail at-grade crossings would require multiple breaks in any noise wall, which in turn compromises its performance. Therefore, noise walls are not considered a reasonable or feasible noise mitigation option for the project area.

The potential for altering train speeds through the project area was also considered for its potential to reduce train noise levels. Faster moving trains take less time to pass by and therefore, receptors have reduced exposure periods to train noise. Allowable train speed for a location is based on track conditions and layout, congestion, and other safety parameters. Currently, trains move slowly through the project area, causing longer exposure times for train-induced noise levels. The Proposed Project, with its extensive physical improvements to the PAS Connecticut River Line, will result in increased speed for freight trains (from 10 mph to 45 mph) and speeds of 60 mph for the Vermonter. These increased operating speeds will have a noticeable effect on exposure periods to train noise.

3.2 Biological Environment

3.2.1 Ecological Systems

The Project route passes by and over a range of habitats, including woodlands, rivers, water bodies, and emergent and forested wetland systems, some of which are mapped habitat for state-listed species and a limited number of federally-listed species.

The Massachusetts Endangered Species Act (MESA) is implemented by the Division of Fisheries and Wildlife - Natural Heritage and Endangered Species Program (NHESP). MESA protects rare species and their habitats by prohibiting the "take" of any plant or animal species listed as Endangered, Threatened, or of Special Concern by the Massachusetts Division of Fisheries and Wildlife. As part of MESA implementation, NHESP is responsible for reviewing projects and providing and maintaining maps that identify protected species habitat. Shown on these maps are two types of protected species habitat: Priority Habitat for State Protected Species and Estimated Habitats for Rare Wildlife. Priority Habitat includes habits for wetland and non-wetland wildlife and plant species. Estimated Habitat includes habitat for wetland dependent wildlife (animal) species only and is intended for use by both NHESP and local Conservation Commissions during the review of projects subject to the Wetlands Protection Act.

According to the NHESP database, both the current Vermonter route and the Proposed Project route are adjacent to mapped Priority Habitat and Estimated Habitat (see **Appendix D, Figure 1**) and cross mapped habitat in several municipalities. The entire length and width of the Connecticut River is mapped Priority Habitat and Estimated Habitat.

No-Build Alternative

The No-Build Alternative would have no new impact on protected species habitat. The Vermonter would continue to travel along existing rail right-of-way that passes through or adjacent to protected habitats.

Proposed Project

Project activities will be located within previously disturbed and cleared areas within the existing maintained right-of-way of the PAS Connecticut River Line and no impacts to vegetated areas are proposed. Therefore, the proposed Project is not anticipated to result in a take and the need for a Conservation and Management Permit under MESA.

3.2.2 Threatened and Endangered Species

The purpose of the U.S. Endangered Species Act (ESA) is to protect and recover imperiled species and the ecosystems upon which they depend. It is administered by both the Interior Department's U.S. Fish and Wildlife Service (USFWS) and the Commerce Department's National Marine Fisheries Service (NMFS). USFWS has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of NMFS are mainly for marine wildlife such as whales and anadromous fish species.

Under the ESA, species may be listed as either endangered or threatened. "Endangered" means that a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means that a species is likely to become endangered within the foreseeable future.

The ESA protects endangered and threatened species and their habitats by prohibiting the "take"[4] of listed animals and the interstate or international trade in listed plants and animals, including their parts and products, except under federal permit.

Two federally-listed endangered species have been identified as occurring in the Connecticut River: the Dwarf Wedgemussel (*Alasmidonta heterodon*) and Shortnose Sturgeon (*Acipenser brevirostrum*). See **Appendix D** for further information on the federally-listed endangered species.

No-Build Alternative

The No-Build Alternative would have no new impact on rare species, federally-listed threatened or endangered species, or state-listed species or designated protected species habitat.

Proposed Project

The Proposed Project would occur within the existing disturbed areas of the PAS Connecticut River Line right-of-way; therefore, no new impacts to identify threatened or endangered species or their habitats are anticipated.

As both identified federally endangered species are likely to exist solely within the Connecticut River, and no in-water work within the river is proposed, project activities are not anticipated to affect federally endangered species. Further consultation with the USFWS may be necessary if it is determined that a federal permit is required (e.g., Corps of Engineers Section 10 permit or U.S. Coast Guard Bridge Act permit) with subsequent Section 7 consultation. At this time, however, consultation under the Endangered Species Act is not anticipated for the reasons noted above.

3.3 Human Environment

3.3.1 Transportation

Rail Transportation and the Regional Roadway Network

The three major north-south corridors within the study area include the NECR rail line, Connecticut River Line railway, I-91, and the Connecticut River.

The Vermonter operates between St. Albans, VT to Washington, D.C., providing one daily round trip. Within the study area, the Amtrak Vermonter travels east from Springfield to Palmer on the CSX Boston line, then north to East Northfield on the NECR line, stopping in Amherst (PVPC RTP, 2007). This service

[4] Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." Through regulations, the term "harm" is defined as "an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering." Listed plants are not protected from Take, although it is illegal to collect or maliciously harm them on federal land. Protection from commercial trade and the effects of federal actions does apply for plants. In addition, states may have their own laws restricting activity involving listed species, as Massachusetts does.

route is about 60 miles long and requires additional mileage and travel time due to the 55 mph speed limit and need to reverse direction in Palmer. In 2008, ridership was estimated to be about 72,655 passengers on this route. In addition to passenger rail, the route also handles north-south freight operations. The CSX line is the largest ton-mile freight line in Massachusetts.

The PAS Connecticut River Line operates from Springfield to East Northfield, through the communities of Holyoke, Northampton, and Greenfield. Current freight train traffic on the line between Greenfield and Springfield consists of seven trains per day. The PAS Connecticut River Line is 49 miles. Current track conditions restrict train speeds to 10 mph. This rail line is currently only used for freight movements. The PAS Connecticut River Line was previously used for passenger rail transportation, and stations still exist within Holyoke, Northampton and Greenfield, MA.

I-91 provides north-south access to Vermont and Connecticut. The basic highway network including interstate highways, U.S. numbered routes and state routes, along with other traffic arteries, provides access to all municipalities in the region, both urban and rural. The pattern of principal arterial highways in the region is radial, extending outwards from each of the region's major centers, a consequence of development and topographic influences. Traffic projections for Pioneer Valley indicate that regional VMT will continue to increase by an additional 1.3 percent per year from 2003 to 2010, 2.2 percent per year from 2010 to 2020 and 3.6 percent per year from 2020 to 2030 in Pioneer Valley (PVPC RTP, 2007).

The Connecticut River is the longest river in New England stretching 410 miles from its source to the sea. The river is bounded by four New England states - New Hampshire, Vermont, Connecticut and Massachusetts as it flows south to Long Island Sound. It was the nation's first large river developed for transportation and is one of the few large, developed rivers in the US without a port city at its mouth. Historically, north-south transport on the river was by ice sled, canoe, flatboat, log raft, and eventually steam boat. The river became famous for its log drives and the innovative precision manufacturing that took place along its banks. Today the river is still used for shipping as well as for hydrological projects, ferry operations, and recreational activities. In 1998 the Connecticut River was one of the 14 American Heritage Rivers designated by President Clinton, due to its historic and cultural significance to the nation (Connecticut River Watershed Council, 2009).

No-Build Alternative

The No-Build alternative would not create new impacts to freight or passenger rail transportation. Amtrak's Vermonter service would continue to use the congested CSX Boston line from Springfield to Palmer. Under the No-Build alternative, traffic on I-91 and regional/local roadways would continue to increase over time. The Vermonter would continue to service the Amherst area which has a low population density, with a cluster of 525,000 people near the I-91 and NECR corridor. The No-Build alternative would not be consistent with Pioneer Valley's objective to develop balance in the regional transportation system or encourage congestion friendly alternatives to automobile travel such as public transportation, ridesharing, bicycling and walking (PVPC, 2007).

Proposed Project

The Proposed Project would have a positive impact on passenger rail transportation by offering new service between White River Junction, VT and Springfield, MA on the PAS Connecticut River Line. The PAS Connecticut River Line travels through more densely populated areas including Northampton,

Holyoke and Springfield. These areas are quite large in comparison to Amherst and have population densities of about 150,000. Projected annual ridership as a result of the proposed project would be about 116,000 annual passengers by 2015.

The Proposed Project would also have a beneficial impact on freight movements between Massachusetts and Connecticut. Improvements to the PAS Connecticut River Line would result in faster, more cost-effective freight operations, and are anticipated to increase freight rail traffic as shown in **Table 3.3.1–1**.

Table 3.3.1–1 Train Traffic on the PAS Connecticut River Line

		Current	Proposed
Freight Trains	Daytime trains (7AM – 10 PM)	7	9
	Nighttime trains (10PM – 7AM)	2	2
	No. of Locomotives	1 or 2	1 or 2
	No. of Cars	20-40	20-50
	Speed (mph)	10	40
Passenger Trains	Daytime trains (7AM – 10 PM)	0	2
	Nighttime trains (10PM – 7AM)	0	0
	No. of Locomotives	0	1
	No. of Cars	0	5
	Speed (mph)	0	60

Improvements to the track along this route would provide an opportunity to improve the freight service along the entire PAS Connecticut River Line. More efficient track operations would likely encourage some freight trucking shippers using I-91 and I-90 to switch to rail transport, thereby reducing environmental and other impacts of truck transport and the need for future maintenance and repair along regional roads.

Projections for completion of the Project indicate that there will be one additional freight train operating on the PAS Connecticut River Line and that by 2030, freight traffic will increase by 50 to 100 percent. Freight train speed will increase from 10 mph to 40 mph. Amtrak trains will travel at about 60 mph. Freight travel times may change slightly to allow for Amtrak travel on the Connecticut River line, but this would not negatively affect overall freight service. The increase in average speed and number of cars per train coupled with track improvements would result in more efficient freight operations.

The Proposed Project would have a positive impact on vehicular transportation in the I-91 corridor by offering an alternative to the private automobile for commuters, residents and tourists. The Proposed Project would reduce congestion, thereby resulting in travel cost savings, as well as decreasing the potential for traffic incidents. Existing bus service within the study area would facilitate north/south travel between communities to reach proposed rail stations in Northampton and Greenfield, MA.

Current bus service would provide public access to reach proposed transit stations. Pioneer Valley Transit Authority (PVTA) red and blue lines provide daily bus service along I-91, from Northampton to Holyoke continuing to Springdale, MA. A PVTA bus stop currently exists at the intersection of Pleasant Street and Railroad Avenue. This intersection has a pedestrian crosswalk and would require passengers to walk a few hundred feet to the existing rail station. Franklin County Transit Authority (FCTA) provides bus service from Greenfield to Northampton via the Valley Route line, also operating daily. This route would require a transfer on to a PVTA bus line to reach the bus stop located at Pleasant Street and Railroad Avenue. Both Greenfield and Northampton have identified plans to expand bus service in their municipal transportation plans in order to further facilitate inter-modal transportation. Enhancing rail service in the study area would be consistent with Pioneer Valley's goal to plan a coordinated, multi-modal, environmentally sound transportation system which moves people and goods safely, dependably, and efficiently (PVPC, 2009).

Local Vehicular Transportation

PVPC RTP goals identify the need to address traffic congestion problems on local roads by providing alternatives to single-occupancy vehicles rather than constructing additional roads or lanes. The roadway mileage in the Pioneer Valley has remained fairly consistent over the last several years. In contrast, traffic on the region's roadways has been increasing. The magnitude of increase is shared in the region's rural areas as well. The increase in vehicle-miles-travelled (VMT) is the result of a regional and nation trend in increased vehicle ownership and decreased vehicle occupancy rates (Regional Transportation Plan for Pioneer Valley, 2007).

Generally speaking, this puts more single occupant vehicles on the roadway system, thus, increasing the total VMT daily. Based on information from the 2000 Census, about 20 percent of residents work outside of their county of residence and spend an average of 20 minutes driving in each direction. Nearly 75 percent of all work trips in the Pioneer Valley are made via the single occupant vehicle. The remaining 25 percent of travelers carpool to work, followed by commuters that walk to work and bus riders (see **Figure 3.3.1-1**) (U.S. Census Bureau, Census 2000 Summary File 3).

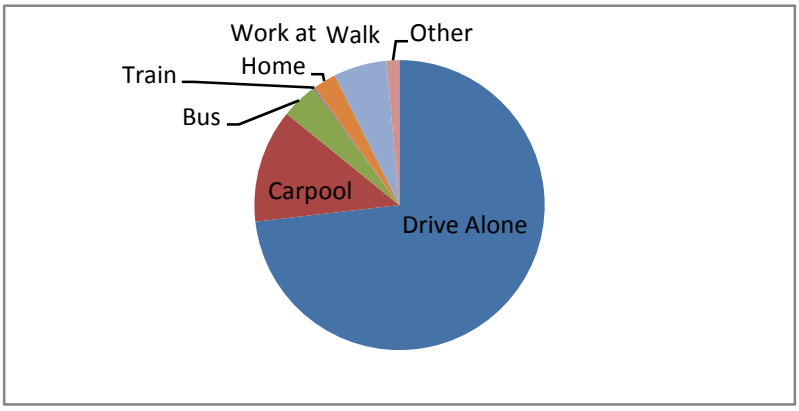


Figure 3.3.1-1 Commuting in the Project Area

Many communities in the Pioneer Valley area currently provide multi-use paths or "rail trails" totaling 17 miles in the region, with more projects under design with MassHighway. The six completed bike paths in the region include the Norwottuck Rail Trail, Springfield Connecticut River Walk & Bikeway, the Amherst-UMass Connector Bikeway, the Amherst Bi-Walk, the Easthampton Manhan Rail Trail and the Northampton Bike path (2007 RTP). The city of Northampton is currently completing construction of their bicycle and pedestrian path, which will connect to the Northampton Station, to further facilitate multi-modal transportation in the study area.

Bus service currently runs along Route 9, through the cities of Northampton and Amherst, MA. The Minute Man Express provides express weekday service every half hour from University of Massachusetts to Smith College, while the University is in session. The Red line provides year-round service seven days a week, about 45 times daily on weekdays and 25 times on weekends (PVTA, 2007). The Pioneer Valley Transit Authority also offers a "Rack and Roll" program which provides bicycle racks on transit buses to further provide opportunities for multi-modal travel in the area. Therefore, existing public bus systems would provide service for residents living in Amherst and travelling to Northampton for Amtrak service.

Two new stations are proposed for Northampton and Greenfield, MA. The Northampton location would utilize the existing railroad station and parking area with upgrades to the station platform. The proposed future inter-modal hub on King Street would facilitate travel to and from the railroad station (King Street Corridor Study, 2003). The Greenfield station would be located at the proposed multi-modal hub on Bank Row utilizing the old Toyota dealership on Olive Street. The City of Greenfield will not construct a new parking lot and plans to use the adjacent parking garage for visitors to the Bank Row shopping area and Garden Cinema. (Greenfield Redevelopment Authority, 2009).

Northampton and Greenfield have identified inter-modal hubs in their future land use plans. Northampton implemented a policy to work with PVPC to consider a centralized public transit or multi-modal facility in Northampton on King Street adjacent to the PAS right-of-way (City of Northampton, 2005). The Greenfield Redevelopment Authority also identified a future site for an inter-modal hub on King Street in close proximity to the existing railroad station (Greenfield Redevelopment Authority, 2009).

The availability of bus service and proposed addition of a multi-modal hub for commuters in the region would likely decrease single-occupancy vehicular travel in the study area.

The General Plans of Northampton, Greenfield and Amherst also identify goals to enhance bus service. Enhanced bus service will compliment the planned inter-modal hubs and railroad stations in Northampton and Greenfield which would reduce the need for single-occupant automobile travel to the proposed stations. The addition of transit stations would likely change traffic patterns on local roadways due to travelers accessing and parking at stations. However, the two proposed locations for stations, associated parking and necessary access are consistent with existing and future land use plans as well as existing and future regional and local transportation plans. The location of stations would provide service to the maximum number of users including major activity nodes and housing concentrations.

It is assumed in this analysis that passengers living within 1.0 mile of a station would walk to the station. Passengers living outside a 1.0 mile distance would likely take some other form of transportation, either public or private, to access the station. Therefore, the primary impacts of relocating a station are felt by the population within 1.0 mile of the station; those living outside the 1.0 mile distance are still affected, but generally at a lesser level of inconvenience depending on the additional driving time.

No-Build Alternative

The No-Build Alternative would not change local vehicular transportation or bicycle and pedestrian facilities. Within the study area I-91 traffic volumes are projected to steadily increase, especially north of Northampton and south of Springfield at the Connecticut State line (PVPC, 2007). The PVPC RTP identified that I-91 in Northampton experienced the highest average increase in highway volume, 40 percent, between 1993 and 2003. Over time, vehicular congestion would continue to increase resulting in potential need to repair and maintain local roads. In addition, The No-Build Alternative would not be consistent with the goals and objectives identified by PVPC and in municipal General and Transportation Plans for development of a multi-modal transportation system within the study area.

Proposed Project

The Proposed Project would be consistent with the PVPC goal to provide an alternative to automobile travel. **Figure 3.3.1-2** illustrates population densities within close proximity of the current and proposed stations. The Proposed Project would increase access to passenger rail stations by relocating the stations to population centers in Northampton and Greenfield, and creating the potential for a future station in Holyoke. Based on 2000 U.S. Census data (projected to 2003) there are approximately 12,400 people living within 1.0 mile of the Northampton station and 8,800 living within 1.0 mile of the Greenfield station. In addition, there are currently 17,200 people living within 1.0 mile of the Holyoke station.

Passengers currently using the Amherst station would be required to reroute their trip to the Northampton station, about 8 miles away. There are about 6,400 residents living within a one-mile radius of the Amherst station. Residents outside this area likely use transit or private automobiles to travel to the Amherst station, especially during the winter months. Automobile travel to the new stations would likely require east-west travel on Route 9 from Amherst to Northampton station service areas. PVTA provides bus serve along Route 9 connecting Amherst to Northampton while FCTA provides bus service along Route 5 connecting Greenfield and Northampton. PVTA service continues in to Holyoke and Springfield, MA. Both Greenfield and Northampton have identified plans to expand bus service in their municipal transportation plans in order to further facilitate inter-modal transportation.

Enhanced passenger rail service would provide residents with transportation options beyond the private automobile for intra-region and inter-region travel. With encouragement from PVPC, the municipalities in the study area have outlined a plan and policy related actions and projects to enhance multi-modal travel.

These improvements would minimize the need for residents to drive to rail stations and reduce the

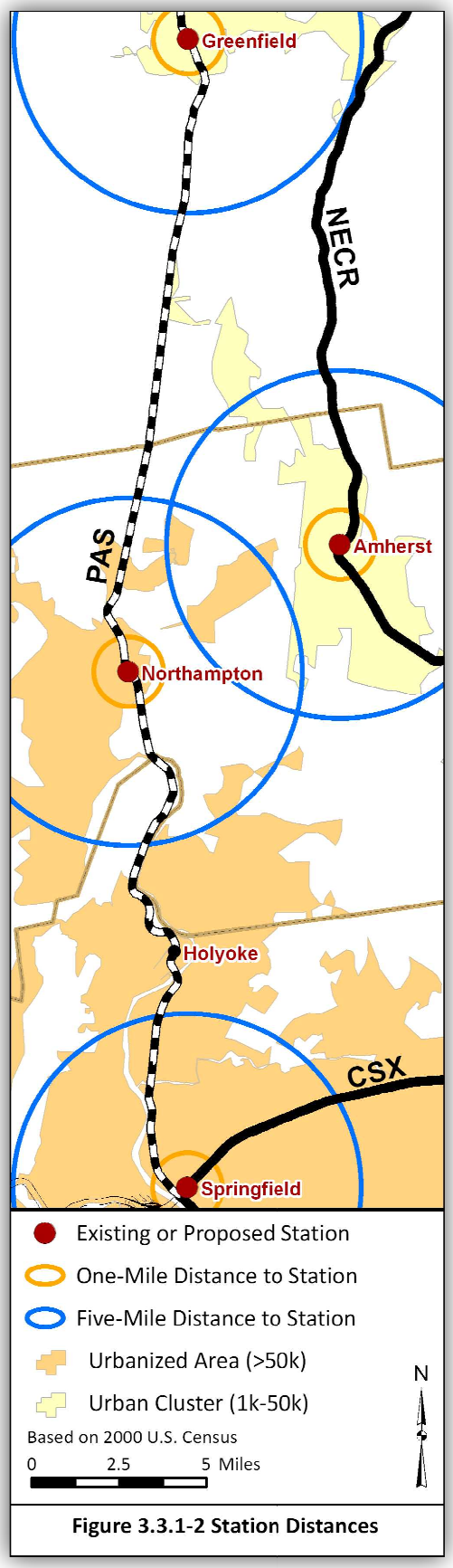


Figure 3.3.1-2 Station Distances

number of vehicles on regional and local roads by serving more communities along the PAS Connecticut River Line. Therefore, the Proposed Project and rerouting of Amherst riders would not adversely impact local traffic patterns.

There are 38 crossings along the NECR line between St. Albans, VT and Springfield, MA. Along the PAS Connecticut River Line, 37 crossings exist between St. Albans, VT and Springfield, MA. Because the proposed project is located within existing right-of-way, relocation of the Vermonter will not result in additional new crossings of regional or local roads. As part of the project, grade-crossings would be improved on the PAS Connecticut River Line to facilitate safe and efficient travel throughout the study area. Proposed track improvements will increase efficiency and speed of rail operations; as a result, wait time at each crossing would decrease under the Proposed Project.

3.3.2 Land Use and Zoning

In recent years, the Pioneer Valley has experienced sprawl without population growth. Between 1970 and 2000, the population in the Pioneer Valley increased by less than 5 percent, while at the same time, total developed land in the region increased by 49 percent. In the 1990s the region's population remained relatively stable while about 40,000 acres of farm land was developed for commercial or residential use (PVPC, 2009).

In 1997 the PVPC decided to revisit regional land use and promote smarter growth strategies. In 2000, Massachusetts Executive Office of Housing and Economic Development (EOHED) passed Executive Order 418, to guide planning funds for all Massachusetts communities to help promote opportunities to build vibrant communities while linking housing with economic development, transportation, and open space and resource protection (EOHED, 2009).

The Pioneer Valley RTP continues to support strategies and projects that promote livable communities, provide for the efficient movement of people and goods and advance the economic vitality of the region. Land use goals identified in the plan aim to incorporate the concepts of sustainable development in the regional transportation planning process.

The study area lies within the boundaries of Franklin, Hampden, and Hampshire counties. Franklin and Hampden Counties are mostly rural with a sparse population and large geographical area. Hampshire is more densely developed with a greater population density. The northern portion of the Knowledge Corridor is less densely developed than land along the southern portion, especially between Northampton and Springfield, MA.

The Massachusetts Department of Revenue indicates that an average of 75 percent of land within the study area is zoned for residential use. However, zoning designations adjacent to and within a half-mile of the PAS Connecticut River Line vary by community. Municipalities within the study area have demonstrated support of regional goals by encouraging multi-modal transportation within their boundaries and guiding land use development towards transit-oriented development (Pioneer Valley Transportation Plan, 2007).

Springfield

Springfield is a densely developed city bordered by the Connecticut River on the east. Land-use west of the PAS Connecticut River Line consists of a mixture of Commercial/Retail, Institutional/Public Facilities/Conservation, Industrial and Residential lands adjacent to the PAS Connecticut River Line right-of-way and continuing further out about a half-mile. East of the alignment, across the Connecticut River, land use is largely residential with some Commercial/Retail and Industrial development at the southern most portion of the city. See **Figure 3.3.2–1,** Springfield Land Use, for further detail.

Holyoke

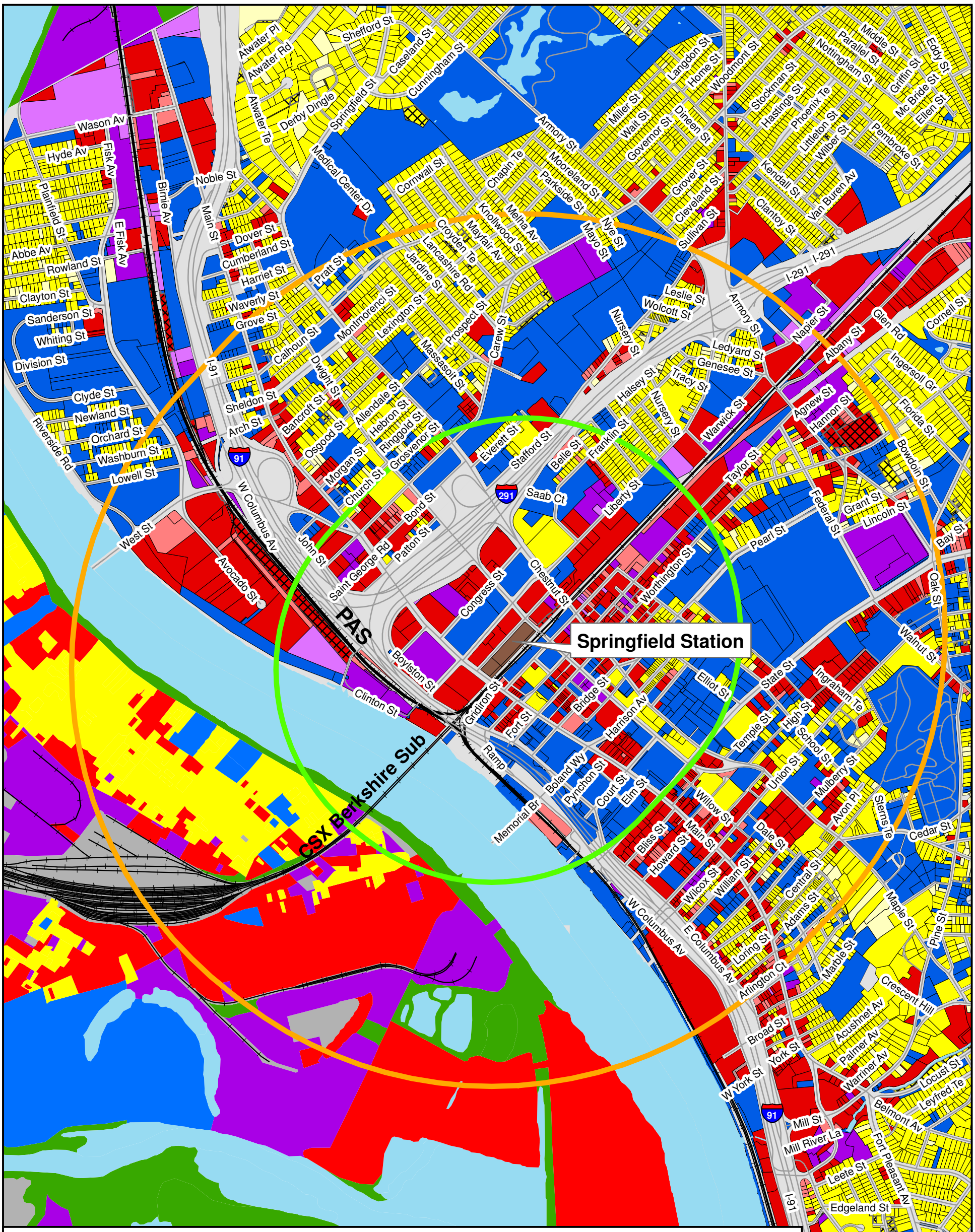
Holyoke is generally an equal mix of Industrial and Commercial/Retail east and west of the PAS Connecticut River Line right-of-way. Within about a half-mile in either direction of the right-of-way, zoning consists of Industrial and Institutional/Public Facilities/Conservation with a cluster of residential development to the east. Further east, across the Connecticut River development consists of Residential, Industrial and Forest/Agricultural/Recreational use. See **Figure 3.3.2–2,** Holyoke Land Use, for further detail.

Northampton

Northampton land use adjacent to the PAS Connecticut River Line is generally industrial west of the right-of-way and residential east of the right-of-way. The eastern portion of the area is less densely developed than the western portion which has a large amount of residential and Institutional/Public Facilities/Conservation development. As the rail line exits the city towards Greenfield, land use changes to a cluster of Industrial and Commercial/Retail use. See **Figure 3.3.2–3,** Northampton Land Use, for further detail.

Greenfield

Within Greenfield, the southern portion of the right-of-way is largely Forest/Agricultural/Recreational on the east side of the alignment with some Residential and Commercial development to the west. As the alignment enters the center of the city, land use adjacent to the railroad is a mix of residential, commercial and Institutional/Public Facilities/Conservation. As the corridor continues north of the proposed station, land use becomes largely residential with a small amount of commercial and industrial use immediately adjacent to the right-of-way. Once the rail line crosses Route 2 into the more developed portion of Greenfield, land use changes to General Industry directly east and west of the right-of-way. See **Figure 3.3.2–4,** Greenfield Land Use, for further detail.


Springfield Station
PAS
CSX Berkshire Sub
Shefford St
Atwater Pl
Atwater Rd
Caseland St
Cunningham St
Atwater Te
Derby Dingle
Springfield St
Wason Av
Hyde Av
Fisk Av
Plainfield St
Birnie Av
Noble St
Medical Center Dr
Cornwall St
Chapin Te
Armory St
Mooreland St
Parkside St
Miller St
Wait St
Governor St
Dineen St
Langdon St
Home St
Woodmont St
Middle St
Parallel St
Nottingham St
Griffin St
Eddy St
Stockman St
Hastings St
Phoenix Te
Littleton St
Wilber St
Mc Bride St
Ellen St
Pembroke St
Kendall St
Van Buren Av
Grover St
Cleveland St
Clantoy St
Sullivan St
Nye St
Mayo St
Melha Av
Knollwood St
Croyden Te
Mayfair Av
Lancashire Rd
Jardine St
Pratt St
Dover St
Cumberland St
Harriet St
Waverly St
Grove St
Main St
Abbe Av
Rowland St
Clayton St
Sanderson St
Whiting St
Division St
E Fisk Av
I-91
Montmorenci St
Lexington St
Calhoun St
Dwight St
Prospect St
Carew St
Massasoit St
Nursery St
Leslie St
Wolcott St
Armory St
I-291
Napier St
Albany St
Glen Rd
Cornell St
Ledyard St
Genesee St
Tracy St
Halsey St
Ingersoll Gr
Florida St
Agnew St
Hannon St
Warwick St
Franklin St
Bowdoin St
Taylor St
Clyde St
Newland St
Orchard St
Washburn St
Lowell St
Riverside Rd
Sheldon St
Arch St
Bancroft St
Allendale St
Hebron St
Ringgold St
Grosvenor St
Osgood St
Morgan St
Church St
Everett St
Stafford St
Belle St
Saab Ct
Liberty St
Federal St
Grant St
Lincoln St
Bay St
Pearl St
Oak St
Walnut St
Worthington St
Chestnut St
Congress St
Boylston St
Bond St
Patton St
John St
Saint George Rd
Avocado St
West St
W Columbus Av
Clinton St
Gridiron St
Ramp
Fort St
Bridge St
Elliot St
State St
Ingraham Te
Harrison Av
Temple St
High St
School St
Union St
Mulberry St
Boland Wy
Pynchon St
Court St
Elm St
Willow St
Avon Pl
Sterns Te
Cedar St
Memorial Br
Bliss St
Howard St
Main St
Dale St
Wilcox St
William St
Central St
Adams St
Maple St
Pine St
E Columbus Av
Loring St
Arlington Ct
Marble St
Crescent Hill
Broad St
York St
Acushnet Av
Palmer Av
Warriner Av
W York St
Locust St
Leyfred Te
Belmont Av
Mill St
Mill River La
Fort Pleasant Av
Leete St
Edgeland St
I-91
Warner St
Sumner Av
Longhill St
Spruceland Av
Cherryvale Av
Legend
Springfield Station
0.5-mile Distance to Station
1-mile Distance to Station
PAS Railroad (Conn River Main Line)
Other Rail
Water
Land Use
Residential
Developable Land - Residential
Undevelopable - Residential
Commercial/Retail
Developable Land - Commercial
Undevelopable - Commercial
Industrial
Developable Land - Industrial
Institutional/Public Facilities/Conservation
Forest/Agricultural/Recreational
Land Use Unknown
N
Scale: 1 Inch = 1,250 Feet
0 625 1,250 Feet
Prepared By: HDR
EOT Executive Office of Transportation
Knowledge Corridor - Restore Vermonter
Springfield to East Northfield, Massachusetts
Springfield Current Land Use
Figure 3.3.2-1

Legend

- Holyoke Station
- 0.5-mile Distance to Station
- 1-mile Distance to Station
- PAS Railroad (Conn River Main Line)
- Other Rail

Land Use

- Residential
- Developable Land - Residential
- Undevelopable - Residential
- Commercial/Retail
- Developable Land - Commercial
- Undevelopable - Commercial
- Industrial
- Developable Land - Industrial
- Undevelopable - Industrial
- Institutional/Public Facilities/Conservation
- Vacant - Institutional
- Forest/Agricultural/Recreational
- Land Use Unknown

N

Scale: 1 Inch = 1,250 Feet

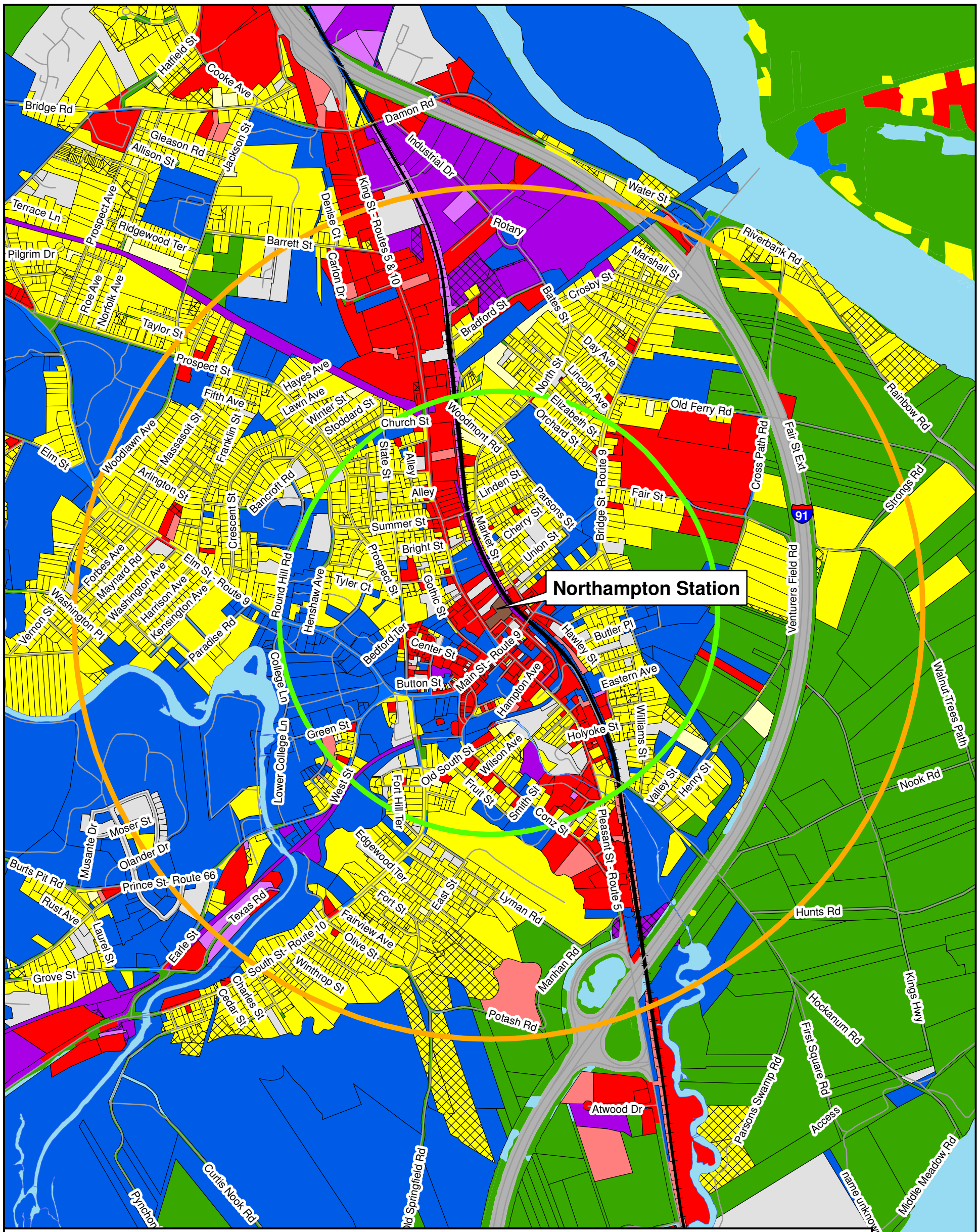
0 625 1,250 Feet

Prepared By: HDR

EOT Executive Office of Transportation

Knowledge Corridor - Restore Vermonter
Springfield to East Northfield, Massachusetts

Holyoke Current Land Use
Figure 3.3.2-2



Legend

- Northampton Station
- 0.5-mile Distance to Station
- 1-mile Distance to Station
- PAS Railroad (Conn River Main Line)
- Water

Land Use

- Residential
- Developable Land - Residential
- Undevelopable - Residential
- Commercial/Retail
- Developable Land - Commercial
- Undevelopable - Commercial
- Industrial
- Developable Land - Industrial
- Undevelopable - Industrial
- Institutional/Public Facilities/Conservation
- Forest/Agricultural/Recreational

N

Scale: 1 Inch = 1,250 Feet

0 625 1,250 Feet

Prepared By: HDR

EOT Executive Office of Transportation

Knowledge Corridor - Restore Vermonter
Springfield to East Northfield, Massachusetts

Northampton Current Land Use
Figure 3.3.2-3

Legend

- Greenfield Station
- 0.5-mile Distance to Station
- 1-mile Distance to Station
- PAS Railroad (Conn River Main Line)
- Other Rail
- Water

Land Use

- Residential
- Developable Land - Residential
- Undevelopable - Residential
- Commercial/Retail
- Developable Land - Commercial
- Undevelopable - Commercial
- Industrial
- Developable Land - Industrial
- Undevelopable - Industrial
- Institutional/Public Facilities/Conservation
- Forest/Agricultural/Recreational

N

Scale: 1 Inch = 1,250 Feet

0 625 1,250 Feet

Prepared By: HDR

EOT Executive Office of Transportation

Knowledge Corridor - Restore Vermonter
Springfield to East Northfield, Massachusetts

Greenfield Current Land Use
Figure 3.3.2-4

East Northfield

As the PAS Connecticut River Line travels through Northfield, the corridor is surrounded by forest/agricultural/recreational land. A small amount of residential development is scattered through this portion of the study area.

Amherst

Approaching Amherst, the NECR corridor travels through mainly Forest land and continues north through low-density residential and crop lands. As the alignment moves through the middle of Amherst, land use becomes medium-density residential with a small portion of multi-family residential use. Land use returns back to forest land and low-density residential development as the alignment continues north and exits the city.

No-Build Alternative

The No-Build Alternative would not impact land use or require acquisition of property in the study area. The No-Build Alternative would be compliant with current zoning, but would not further the regional and local goals to provide an alternative to automobile travel and promote transit-oriented development.

Proposed Project

Changes to service resulting from the Proposed Project would not affect land use, zoning, or property acquisition within the study area. Because the Proposed Project will utilize land along the active PAS Connecticut River Line corridor, zoning is currently consistent with rail activity and would not require changes to support the Proposed Project. The relocation of the Vermonter would change the travel route of Amtrak in to Springfield. The zoning of the area adjacent to the PAS Connecticut River Line is zoned for industrial, commercial and business use. Therefore, the Proposed Project would not result in change to land use or zoning within the City of Springfield.

Track improvements would occur entirely within the PAS Connecticut River Line right-of-way and would not require changes to land use or zoning designations within the study area.

Proposed stations would not negatively affect land use or require significant changes to zoning in the study area. The proposed Northampton station would not require land acquisition because it will use the existing station located off of Railroad Avenue with updates to the station platform. The City of Northampton has also identified a potential site for a future intermodal hub located on King Street to serve commuting residents. In Greenfield, the rail station would be integrated into the soon to be built intermodal station. The Greenfield intermodal station will be located at Bank Row in an area identified for redevelopment. The Proposed Project and proposed station locations would support transit-oriented development and are consistent with local and regional land use plans.

Potential Benefits

The realignment of rail service along the Knowledge Corridor has the potential to provide beneficial economic development impacts for the cities along the corridor that will have station stops as well as the broader region. PVPC (2009) conducted an assessment of the economic development potential related to rail improvements, specifically the potential for development (see **Appendix E**) created by

enhanced passenger rail service and adding commuter rail service. The assessment estimates incremental economic development due to passenger rail; i.e., that additional economic and demographic growth beyond baseline growth forecast for the region.

A summary of the key findings of the economic development analysis includes:

- Enhanced service will most likely have the greatest impact in Northampton due to the characteristics of the city, while the other station cities are expected to incur greater development impacts from Commuter level service.
- The development impacts in 2015 are likely to be significantly smaller than those in 2030, due to the amount of time it generally takes for development to occur as well as the necessary time for the region to overcome its broader development and growth obstacles to fully leverage the benefits of rail.
- While the impacts may seem relatively large, when they are compared to the expected baseline employment and population in each of the cities and "rest of county" areas, the impacts attributable to the rail service are actually relatively modest, not exceeding 5% of the total for any area in the commuter scenario, and are less for the enhanced scenario. These economic estimates are consistent with the region's broader set of development initiatives (with rail being one component of broader plans). The induced job and population growth potential related to rail could help the region become more in line with growth in the rest of Massachusetts, and is consistent with the state's efforts to boost economic opportunities in Gateway Cities.
- The economic risk modeling estimates that there is a 90% chance that the region as a whole can expect development impacts in terms of employment and population of at least 1,500 jobs and 3,000 new residents by 2030 under Enhanced service and at least 2,800 jobs and 6,300 residents under Commuter service.

The Proposed Project does not include enhanced passenger rail service (defined as increased frequency of service) or commuter rail service. However, the improvements to the PAS Connecticut River line and the relocation of the Vermonter passenger rail service to the line opens the door for enhanced rail service and commuter rail service which would otherwise not occur. The improved rail service along the Knowledge Corridor is anticipated to provide employment and population impacts, the level of which will depend upon many factors, including the level of service, the timeframe in which the service is restored, and the region's ability to leverage rail improvements.

3.3.3 Property Acquisition

The PAS operates the PAS Connecticut River Line from Springfield, MA through Greenfield, MA continuing to the New Hampshire state line. Proposed activities would take place entirely within the PAS Connecticut River Line right-of-way. No additional right of way is required.

No-Build Alternative

There would be no additional right of way acquisitions and no relocations or displacements of property owners resulting from the No-Build Alternative.

Proposed Project

The Proposed Project would not affect property ownership within the study area. Rail facility updates and improvements would occur within the existing PAS Connecticut River Line right-of-way. The existing Northampton station and associated parking would be used with updates to the station platform and would not require property acquisition. Similarly, the proposed Greenfield station would be located on property owned by the city which purchased the land in 2009 for the purpose of developing the site as a regional transportation center. Therefore, construction of these two stations would not require property acquisition.

3.3.4 Environmental Justice

Executive Order 12898 requires federal agencies to incorporate consideration of environmental justice into their planning process. The executive order prohibits federal financial assistance for programs and activities that use criteria, methods, or practices that discriminate on the basis of race, color, or national origin. Its goal is to avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority and low-income populations.

Executive Order 12898 defines minorities as individuals of American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic racial heritage. Minority populations are defined as those where either (a) the minority population of the affected area exceeds 50 percent, or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

Within the project area municipalities (as listed in **Table 3.3.4-1**), minority populations make up between 1.3 and 18.3 percent of the population. In comparison, minority populations make up about 1.6 percent of the population in Franklin County, 7.3 percent in Hampshire County and about 20 percent in Hampden County. The City of Springfield, located in Hampden County, has the largest minority population in the study area with about 26.9 percent of residents from African American decent (U.S. Census, 2000).

The average employment rate for municipalities in the study area, 62 percent, is slightly lower than the average employment rate of 66 percent for Franklin, Hampshire and Hampden Counties. Similarly, the average income for residents in the study area, $36,000, is slightly lower than the counties' average income of $40,000 annually (U.S. Census, 2007, PVPC 2009). Within the three counties, low income populations are about 9.4 percent in both Franklin and Hampshire and 14.7 percent and Hampden County. In comparison, the percent of the population living below the poverty level for municipalities in the study area range from lowest 5.0 percent in Northfield to highest 26.4 percent in the City of Holyoke, located in Hampshire County. The City of Holyoke's high poverty level can be attributed to the city's population decline, high percent of rental properties, higher than average vacancy rate, and high percent of subsidized housing within the city (Holyoke, 2009). The City of Holyoke has implemented an Action Plan in conformance with HUD to address the needs of low and moderate income persons.

Table 3.3.4–1 Racial/Ethnic Distribution and Poverty Level

City	Percent Minority Population	Percent of People Below Poverty Level
Northfield	1.3	5.0
Greenfield	4.7	14.0
Northampton	7.4	9.8
Holyoke	7.9	26.4
Springfield	32.9	12.4
Amherst	18.3	20.2
Source: U.S. Census Bureau, Census 2000 Summary File 3, Matrices PCT49, PCT50, PCT51, PCT52, PCT53, PCT54, and PCT55 and Census 2000 Summary File 1, Matrices P3 and P4.		

The Proposed Project's primary ability to affect environmental justice populations is through change of service. It is assumed that populations within 1.0 mile of a station have direct access to passenger rail without requiring other modes of transportation. Passengers outside a 1.0 mile radius would likely use other transportation (local bus service, private vehicle, etc.) to reach the station.

No-Build Alternative

The No-Build Alternative would not have additional disproportionate adverse impacts on minority or low income populations. Passenger rail service would continue to be provided from a single station at Amherst. No passenger rail stations would be provided at Greenfield, Northampton, or Holyoke.

Proposed Project

The Proposed Project would result in a change of service – access to passenger rail service would be relocated from the single station at Amherst to two new stations at Greenfield and Northampton. Access is improved for residents of Greenfield and Northampton. Residents of Amherst would have to travel to Northampton (the closest station) to access the Vermonter. In addition, residents along the PAS Connecticut River Line would experience an increase in train traffic.

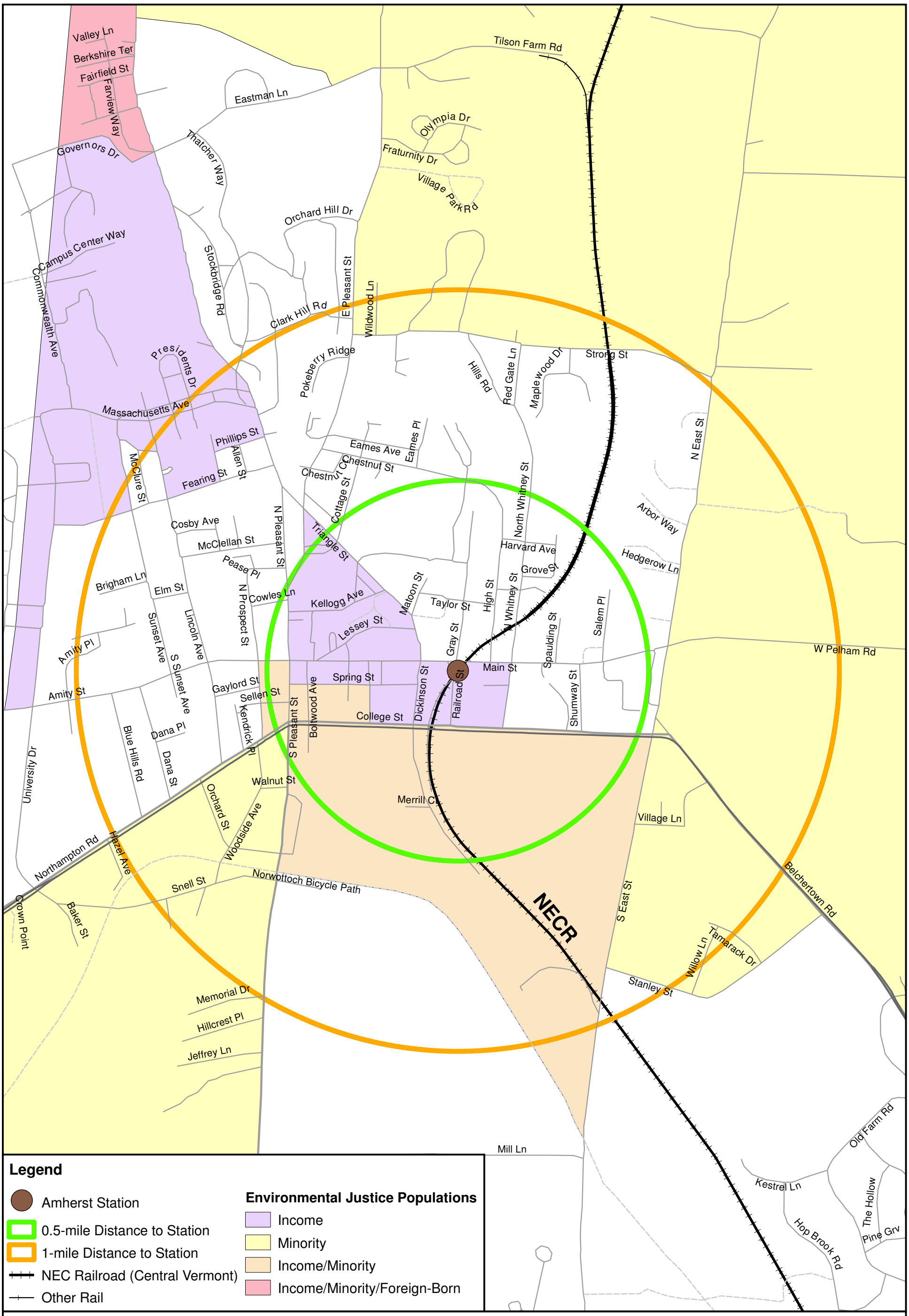
There are environmental justice populations; English proficiency, low-income and/or minority, located within about 0.5 miles of the PAS Connecticut River Line in Northampton, Holyoke and Springfield. The relocation of the Vermonter would add one passenger train to the existing PAS Connecticut River Line. Freight trains are currently operated along this rail corridor; therefore, the addition of passenger rail would not disproportionately affect community facilities or alter neighborhoods where minority populations could potentially reside.

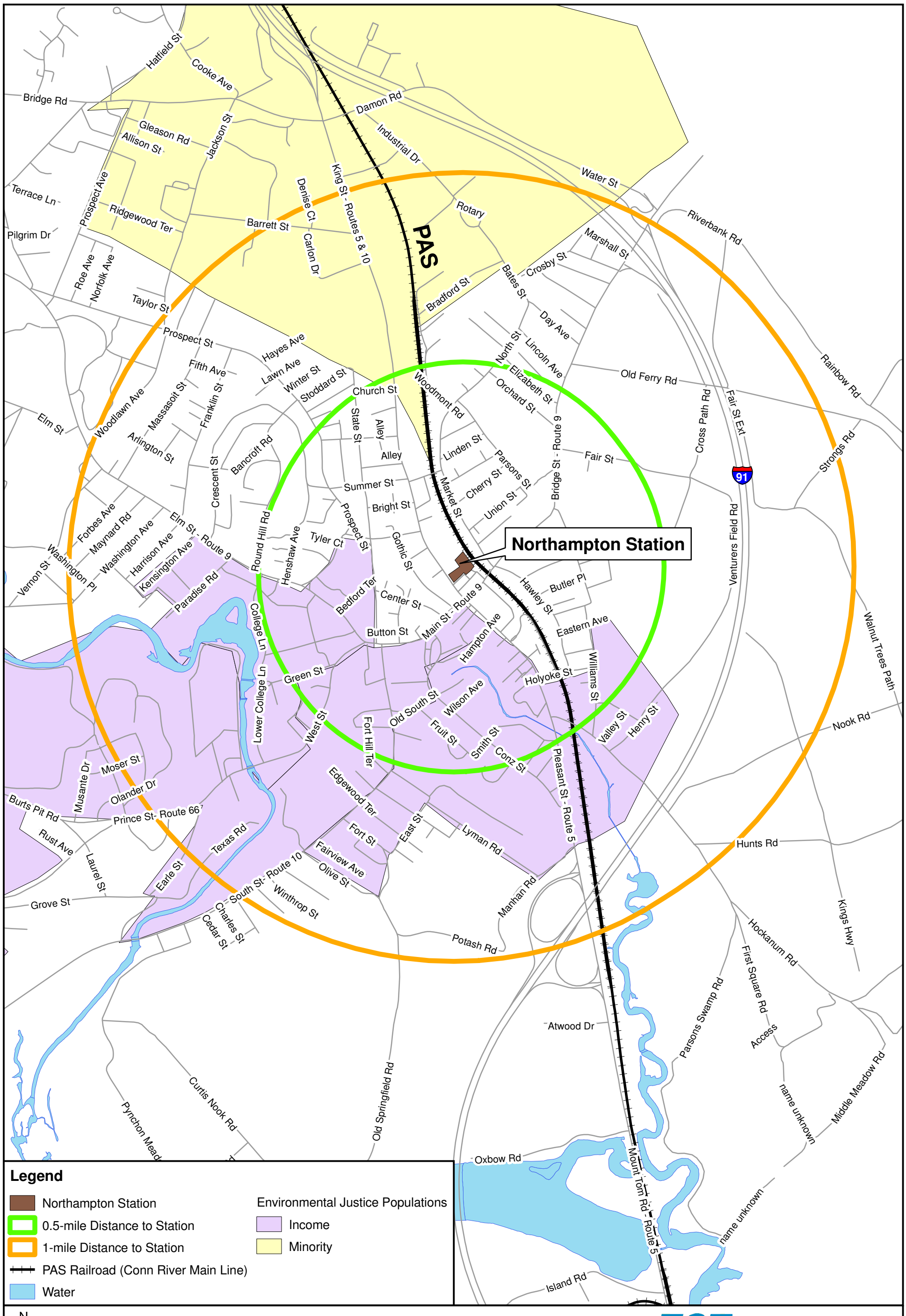
Amherst does have an environmental justice population of low-income and minority residents with about 20 percent of residents living below the poverty level. U.S. Census data indicates that about 5 percent of the population in Amherst uses public transportation for inter-regional and intra-regional travel (U.S. Census, 2007). **Figure 3.3.4-1** shows environmental justice populations in the vicinity of the Amherst station. The Proposed Project would require residents using Amtrak service to reroute their trip to Northampton to reach the relocated rail station. The distance between Amherst and Northampton is only about 8 miles along Route 9, which is currently serviced by PVTA bus service. The Amherst Master Plan indicates that the city will be improving bus facilities to provide year-round, daily,

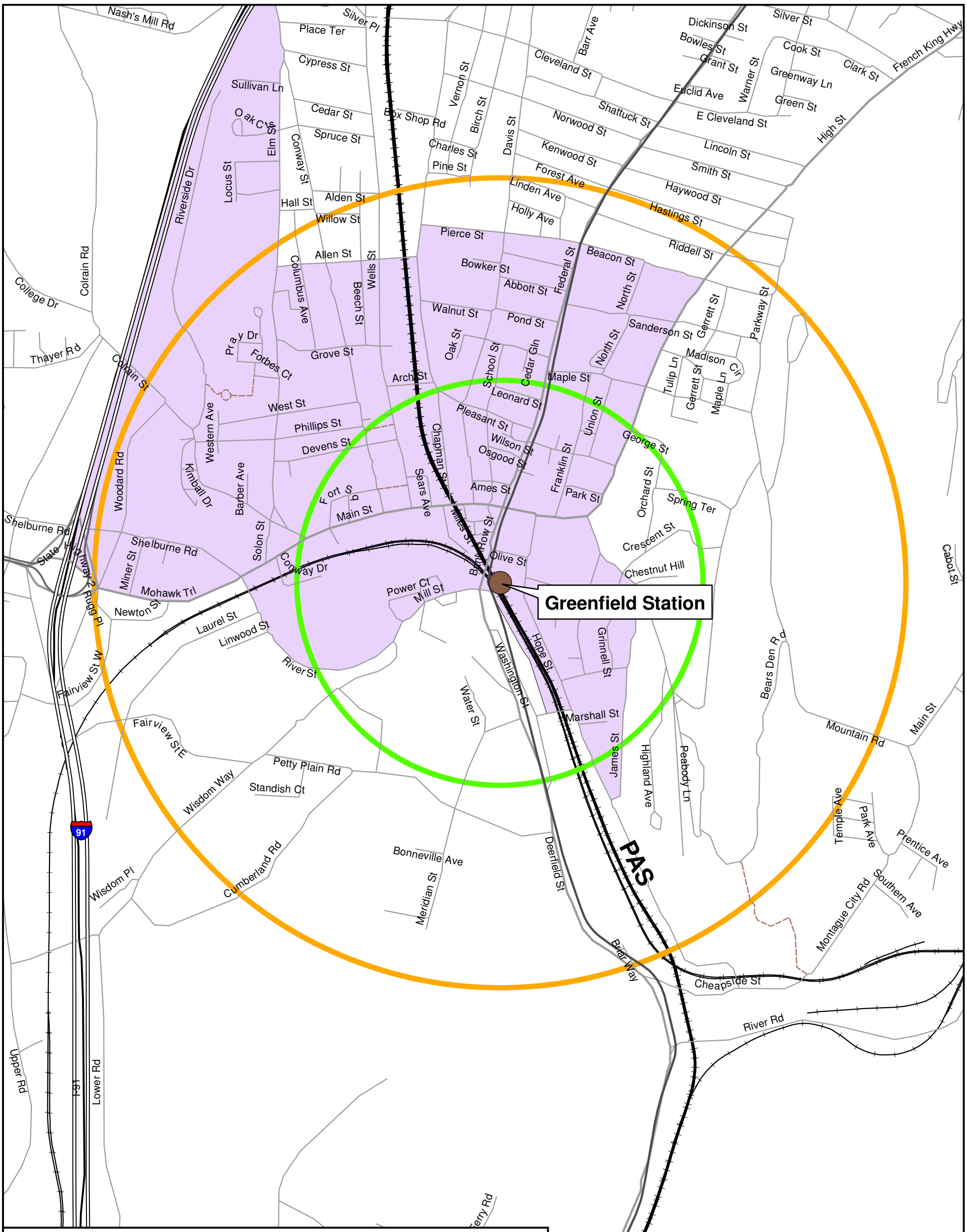
express bus service north-south to link downtown and other points on the route with other village centers. In addition, east-west service will be improved to connect outlying neighborhoods with local service shuttle loops or flex routes. Only a minor portion of the population in Amherst would lose direct access to passenger rail – most of the environmental justice population in Amherst (as well as other Amtrak passengers) live outside the 1.0 mile distance from the station and already take other transportation modes to access the Vermonter.

Relocating passenger rail service to stations in Northampton and Greenfield would benefit the environmental justice populations in those cities, in particular those populations within 1.0 mile of the stations (see **Figures 3.3.4–2** and **3.3.4–3**, respectively). Similarly, Northampton and Greenfield both have plans to incorporate intermodal facilities with development of railroad stations. The Proposed Project would benefit residents by providing additional public transportation services between communities, employment and shopping centers, and recreational amenities.

The Proposed Project would not have a disproportionately high and adverse effect on environmental justice populations; instead, it will have an overall benefit to environmental justice populations in Greenfield and Northampton. Existing and planned public transportation between Amherst and Northampton will provide adequate access to the Northampton station for residents of Amherst.


Valley Ln
Berkshire Ter
Fairfield St
Farview Way
Governors Dr
Eastman Ln
Thatcher Way
Tilson Farm Rd
Olympia Dr
Fraturnity Dr
Village Park Rd
Orchard Hill Dr
Campus Center Way
Commonwealth Ave
Stockbridge Rd
Clark Hill Rd
E Pleasant St
Wildwood Ln
Pokeberry Ridge
Hills Rd
Red Gate Ln
Maplewood Dr
Strong St
Presidents Dr
Massachusetts Ave
Phillips St
McClure St
Allen St
Fearing St
Eames Ave
Eames Pl
Chestnut Ct
Chestnut St
Cottage St
North Whitney St
N East St
Arbor Way
Hedgerow Ln
Harvard Ave
Grove St
Cosby Ave
McClellan St
Pease Pl
N Pleasant St
Triangle St
Brigham Ln
Elm St
Cowles Ln
N Prospect St
Kellogg Ave
Matoon St
Taylor St
High St
N Whitney St
Lessey St
Gray St
Spaulding St
Salem Pl
Amity Pl
Sunset Ave
S Sunset Ave
Lincoln Ave
W Pelham Rd
Main St
Railroad St
Spring St
Dickinson St
Shumway St
Amity St
Gaylord St
Sellen St
Kendrick Pl
S Pleasant St
Bolwood Ave
College St
Dana Pl
Dana St
Blue Hills Rd
University Dr
Walnut St
Merrill Ct
Orchard St
Woodside Ave
Village Ln
Northampton Rd
Hazel Ave
Snell St
Norwottoch Bicycle Path
Crown Point
Baker St
Belchertown Rd
S East St
Willow Ln
Tamarack Dr
Stanley St
NECR
Memorial Dr
Hillcrest Pl
Jeffrey Ln
Mill Ln
Old Farm Rd
Kestrel Ln
The Hollow
Pine Grv
Hop Brook Rd
Legend
Amherst Station
0.5-mile Distance to Station
1-mile Distance to Station
NEC Railroad (Central Vermont)
Other Rail
Environmental Justice Populations
Income
Minority
Income/Minority
Income/Minority/Foreign-Born
N
Scale: 1 Inch = 1,250 Feet
0 625 1,250 Feet
NOTE: Environmental Justice Data from Massachusetts Office of Geographic and Environmental Information (MassGIS), based on 2000 U.S. Census datalayers.
Prepared By: HDR
EOT Executive Office of Transportation
Knowledge Corridor - Restore Vermonter
Springfield to East Northfield, Massachusetts
Amherst Environmental Justice Populations
Figure 3.3.4-1


PAS
Northampton Station
Hatfield St
Cooke Ave
Bridge Rd
Damon Rd
Gleason Rd
Allison St
Jackson St
Industrial Dr
King St - Routes 5 & 10
Water St
Terrace Ln
Prospect Ave
Ridgewood Ter
Denise Ct
Carlon Dr
Barrett St
Rotary
Pilgrim Dr
Riverbank Rd
Marshall St
Crosby St
Roe Ave
Norfolk Ave
Taylor St
Bradford St
Bates St
Day Ave
Prospect St
Hayes Ave
Lawn Ave
Winter St
Stoddard St
Fifth Ave
North St
Lincoln Ave
Elizabeth St
Old Ferry Rd
Rainbow Rd
Church St
Woodmont Rd
Orchard St
Elm St
Woodlawn Ave
Massasoit St
Franklin St
Arlington St
State St
Alley
Alley
Linden St
Parsons St
Fair St
Cross Path Rd
Fair St Ext
Strongs Rd
Bancroft Rd
Crescent St
Summer St
Cherry St
Union St
Bridge St - Route 9
Market St
Bright St
Prospect St
Gothic St
Round Hill Rd
Henshaw Ave
Tyler Ct
Elm St - Route 9
Forbes Ave
Maynard Rd
Washington Ave
Harrison Ave
Washington Pl
Vernon St
Kensington Ave
Paradise Rd
Bedford Ter
Center St
Butler Pl
Hawley St
Venturers Field Rd
Walnut Trees Path
College Ln
Button St
Main St - Route 9
Hampton Ave
Eastern Ave
Lower College Ln
Green St
Holyoke St
Williams St
Nook Rd
West St
Old South St
Wilson Ave
Fort Hill Ter
Fruit St
Smith St
Valley St
Henry St
Conz St
Pleasant St - Route 5
Musante Dr
Moser St
Olander Dr
Edgewood Ter
Burts Pit Rd
Prince St - Route 66
Fort St
East St
Lyman Rd
Hunts Rd
Rust Ave
Laurel St
Texas Rd
Fairview Ave
Earle St
Olive St
South St - Route 10
Manhan Rd
Grove St
Winthrop St
Charles St
Cedar St
Potash Rd
Hockanum Rd
Kings Hwy
First Square Rd
Access
Atwood Dr
Parsons Swamp Rd
name unknown
Middle Meadow Rd
Oxbow Rd
Mount Tom Rd - Route 5
name unknown
Island Rd
91
Legend
Northampton Station
0.5-mile Distance to Station
1-mile Distance to Station
PAS Railroad (Conn River Main Line)
Water
Environmental Justice Populations
Income
Minority
N
Scale: 1 Inch = 1,250 Feet
0 625 1,250 Feet
NOTE: Environmental Justice Data from Massachusetts Office of Geographic and Environmental Information (MassGIS), based on 2000 U.S. Census datalayers.
Prepared By: HDR
EOT Executive Office of Transportation
Knowledge Corridor - Restore Vermonter
Springfield to East Northfield, Massachusetts
Northampton Environmental Justice Populations
Figure 3.3.4-2


Greenfield Station
PAS
Legend
Greenfield Station
0.5-mile Distance to Station
1-mile Distance to Station
PAS Railroad (Conn River Main Line)
Other Rail
Environmental Justice Populations
Income
N
Scale: 1 Inch = 1,250 Feet
0 625 1,250 Feet
NOTE: Environmental Justice Data from Massachusetts Office of Geographic and Environmental Information (MassGIS), based on 2000 U.S. Census datalayers.
Prepared By: HDR
EOT Executive Office of Transportation
Knowledge Corridor - Restore Vermonter
Springfield to East Northfield, Massachusetts
Greenfield Environmental Justice Populations
Figure 3.3.4-3

3.3.5 Public Health and Safety

The existing PAS Connecticut River Line has 22 public and 11 private at-grade crossings within the study area. Of the 11 private at-grade crossings, 5 are "farm" crossings. Freight trains on the PAS Connecticut River Line operate at 10 mph. Similarly, the NECR line from Palmer to East Northfield through Amherst has 38 grade-crossings. Trains on the NECR line operate at 55 mph. The grade-crossings have various forms of control, from actively protected grade crossings predictor technology, such as gates and/or flashing lights, to passively protected crossings with railroad warning signs, such as crossbucks. The level of control required for each grade-crossing is determined by Massachusetts Department of Public Utilities in accordance with FRA requirements.

No-Build Alternative

The No-Build Alternative would not create additional impacts to public health and safety. No changes or upgrades would be made to either the PAS Connecticut River Line grade-crossings or the NECR grade-crossings.

Proposed Project

The Proposed Project adds one train daily north and southbound on the PAS Connecticut River Line and reduces traffic by one train daily north and southbound on the NECR line. The PAS Connecticut River Line would be upgraded to allow increased train operating speeds (60 mph for passenger trains and 45 mph for freight trains). The 22 public grade-crossings on the line would be upgraded to active predictor warning devices (flashing lights or flashing lights and crossing barriers). Grade-crossings would also be improved by replacing track, crossties, and roadway surface, providing a smoother crossing for both trains and motor vehicles. Massachusetts DPU would determine the level of active warning device necessary for each grade-crossing during final design. The private "farm" crossings will be secured with a locked gate and the 5 remaining industrial private crossings will have active warning devices similar to the public crossings. Grade crossings analysis will take into account the frequency of trains at grade crossings, volume of traffic, existing safety devices at grade crossings, and other factors to determine the potential safety impacts of an increase in rail traffic.

Overall, the Proposed Project would improve public heath and safety by upgrading 37 grade-crossings with active warning devices.

Also, by diverting some traffic from I-91, RT-9 and other local roads within the study area, the Project would likely reduce congestion and improve safety on the roads and highways.

3.3.6 Hazardous Materials and Hazardous Waste

Hazardous materials may be encountered during the construction and operation of the Proposed Project. Examples of common hazardous materials include total petroleum hydrocarbons, asbestos, and pesticides. Without proper handling, removal and containment, these materials can pose dangers to human health and the environment. Identifying known and potential contamination prior to construction is important because it can substantially reduce the possibility of exposure to people and the environment.

Hazardous waste sites are regulated by the Resource Conservation and Recovery Act (RCRA); by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); and by various state regulations managed by the Massachusetts Department of Environmental Protection (MassDEP).

No-Build

The No-Build Alternative would not affect hazardous materials or hazardous waste.

Proposed Project

Physical improvements to the PAS Connecticut River Line will occur within the existing right of way. These improvements are primarily surface activities and do not involve large-scale excavations or sub-surface activities. The likelihood of disturbing previously unknown hazardous materials or waste is small but cannot be ruled out. During construction, the contractor will comply with all applicable environmental rules and regulations. Activity associated with the Proposed Project will be conducted in accordance with applicable U.S. Environmental Protection Agency (EPA) and MassDEP regulations and permit requirements. The contractor will prepare a spill prevention control and countermeasure (SPCC) plan that provides specific guidance for managing contaminated media that may be encountered in the right-of-way. If unknown contamination is discovered during construction, the contractor will follow the SPCC plan as well as all appropriate regulations.

3.3.7 Cultural/Historic Resources

Historic and archaeological resources are protected under federal statutes and regulations including the National Historic Preservation Act of 1966 (36 CFR 800), which was created to support efforts to identify and protect sites, buildings, and objects that have historic, architectural, archaeological, or cultural significance. Section 106 of the National Historic Preservation Act (36 CFR 800) (known as "Section 106") requires that federal agencies consider what effects their actions and actions they may assist, permit, or license may have on historic properties.

Federal agencies undertaking project or issuing permits must consider potential impacts to cultural resources including all properties, sites, districts, and traditional cultural properties within the Project's Area of Potential Effect (APE). Agencies must complete a formal consultation with the State Historic Preservation Officer (SHPO) (in Massachusetts, the SHPO is the Massachusetts Historical Commission [MHC]), the Advisory Council on Historic Preservation, and other interested parties with regulatory standing.

Due to the limited scope of work, the FRA, in consultation with the EOT, has defined the APE as limited to the right-of-way. Known historic properties within and in the vicinity of the APE were identified (see **Appendix F**). As part of the Alternatives Analysis process, a review was undertaken of known historic and archaeological resources located within 200 feet of the centerline of the right-of-way of the Knowledge Corridor – Restore Vermonter Project, extending from Springfield to East Northfield. The review included a compilation of all assets listed in the State and National Registers of Historic Places as well as the Inventory of Historic and Archaeological Assets of the Commonwealth (Inventory) maintained by the MHC. Copies of the State and National Register nominations were compiled in reports entitled: *Historic Properties*: *Knowledge Corridor – Restore Vermonter Project* and *Archaeological*

Resources: Knowledge Corridor – Restore Vermonter Project (2009). Both are available upon request from EOT. A list of the resources identified as part of this research effort is included in **Appendix F**.

Any historic or archaeological resources within the right-of-way were buried, removed, or destroyed by the original railroad construction more than 160 years ago, as well as by subsequent construction and maintenance activities.

No-Build Alternative

The No-Build Alternative would have no impact on historic or cultural resources.

Proposed Project

A review of known resources within and in the vicinity of the APE indicates the Project will have no effect on significant historic or archaeological resources. Sixteen bridges were identified in the review of historic resources along the proposed alignment. Proposed work on bridges is limited to in-kind repair or replacement of deteriorated existing bridge components (ties, steel, and bearings) within the existing right-of-way resulting in no effect to historic resources. The review of historic resources indicates grade crossing improvements will be undertaken in one National Register District in Hatfield and Inventoried Areas in each of the following communities: Holyoke, Whatley, Bernardston, and Northfield. Proposed work at all grade crossings is limited to track and roadway removal and replacement within the existing rights-of-way, and the removal and replacement of existing signals in the same locations resulting in no effect to historic resources.

FRA will complete a formal consultation with Massachusetts Historical Commission [MHC] regarding the determination of no effect on historic resources.

3.3.8 Section 4(f) Resources

Section 4(f) of the USDOT Act of 1966 49 USC 303 (Act) provides that the proposed use of land from any significant publicly-owned public park, recreational area, waterfowl or wildlife refuge of national, state, or local significance, or land of an historic site of national, state, or local significance will not be approved by the USDOT unless a determination is made that there is no feasible and prudent alternative to the use of land from that property. The Act also requires that the proposed action includes all possible planning to minimize harm that may result from such use.

A "use" of a 4(f) property occurs when land is permanently taken or temporarily occupied. There can also be a "constructive use" (23 CFR 774.15) when "the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired.[5]"

The Proposed Project includes physical improvements to an existing rail line and a service change. The physical improvements all occur within the existing right-of-way of the PAS Connecticut River Line. The project will not use land from a public park, recreation area, wildlife and waterfowl refuge, or historic site. No Section 4(f) resources will be affected by the project.

[5] 23 CFR PART 774. Parks, Recreation Areas, Wildlife and Waterfowl Refuges, and Historic Sites (Section 4 (f). March 12, 2008. These regulations implement 23 U.S.C. 138 and 49 U.S.C. 303, which were originally enacted as Section 4(f) of the Department of Transportation Act of 1966 and are still commonly referred to as "Section 4(f)."

No-Build Alternative

The No-Build Alternative would not impact any Section 4(f) resources.

Proposed Project

The Proposed Project would not impact any Section 4(f) resources and would therefore have a *de minimis* use of Section 4(f) resources. FRA will complete a formal consultation with Massachusetts Historical Commission [MHC] regarding the determination of a *de minimis* use of a Section 4(f) resource.

3.4 Construction Impacts

The Preferred Alternative would have impacts related to construction; these impacts would be of a relatively short-term nature. Standard specifications for all contracts will require the contractor to comply with and observe all applicable laws, regulations, and orders.

Construction Phasing

The project is anticipated to be constructed in phases. Potential phasing operations are described as follows. The first phase of construction would involve replacing the existed jointed rail with new welded rail, replacing crossties as needed, and reactivating passing sidings and a segment of double track. Bridge repairs would also be accomplished. The second phase would involve signal and communication upgrades, including improvements to all grade-crossings. The third phase would allow for the completion of miscellaneous construction work.

More detailed construction planning will take place as preliminary and final design work is advanced. Only after more design is accomplished can precise definition of construction phasing be developed.

Traffic Impacts

It is expected that construction activities will create minor annoyances through temporary detours to access some businesses and residences, as well as local roadway or grade-crossing closings to accommodate construction activities. A maintenance-of-traffic (MOT) plan that defines measures to minimize impacts on traffic on existing roads will be developed during design. A requirement of this plan will be the need to maintain access to businesses and residences to the extent possible and to keep existing roads open to traffic unless alternate routes are provided. Design of the rail line improvements will be phased in such a way that rail service will be continuous. Overall, the impacts are expected to be temporary and minor.

Air Quality Impacts

Construction activities under the Proposed Project, typical of rail construction projects, would temporarily generate particulate matter (mostly dust) and small amounts of other pollutants. These emissions would be temporary and intermittent during the period of construction, and would contribute only a small amount to the total emissions in the project area.

Emission standards prescribed under federal regulations will be controlled on construction equipment.

Noise Impacts

Construction of the project will create temporary increases in noise. Construction will be completed in phases, with each phase having its own noise characteristics depending on the types of equipment being used. Rail and track construction, for instance, will involve laying track. For the duration of the project construction, the most prevalent source of noise will be from engines.

Utilities

Railroad construction could require temporary relocation of utilities, such as electrical transmission. Appropriate coordination with local utility officials will occur in order to avoid any disruption to service to businesses or residents. Relocating transformers, which may be necessary as a result of the Project, will be performed by qualified personnel.

Water Quality Impacts

The Project is not anticipated to have construction impacts on water quality. There will not be any clearing or grading, there is no in-water work or other work affecting drainages or waterways, and no new impervious surfaces will be added during construction. The contractor will also be required to prepare temporary erosion and sediment control plan and a SPCC plan prior to initiating construction. Implementing these plans will minimize erosion effects, decrease the sediments entering receiving waters from the construction area, and protect against effects from harmful materials spills to streams.

Freight Rail Traffic

The proposed track improvements would occur within existing railroad right-of-way. Track rehabilitation would be performed according to best management practices and have minimal temporary impacts on existing freight rail operations during construction. These minor temporary impacts would cease upon completion of construction.

3.5 Secondary and Cumulative Impacts

3.5.1 Secondary Impacts

Secondary impacts are defined as reasonably foreseeable future consequences that are caused by the proposed action, but that would occur either in the future or in the vicinity of but not at the exact same location as direct impacts associated with implementation of an action alternative. Under the Council on Environmental Quality (CEQ) regulations, secondary impacts are defined as those that are "…caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable. (40 CFR 1508.8b).

Secondary impacts can be associated with the consequences of land-use development that would be indirectly supported by changes in local access or mobility. Secondary impacts differ from those directly associated with the construction and operation of a facility itself and are often caused by what is commonly referred to as "induced development". Induced development would include a variety of alterations, such as changes in land use, economic vitality, property value, and population density. The

potential for secondary impacts is determined in part by local land-use and development planning objectives and the physical location of a proposed action.

No-Build Alternative

The No-Build Alternative would result in a slight secondary impact. The lack of passenger rail service would reduce the economic competitiveness of the municipalities within the project area and would hinder economic development within the study area.

Proposed Project

The Proposed Project would result in secondary impacts by creating potential for economic growth within the study area and opportunity to pursue transit-oriented developments at the proposed Northampton and Greenfield station locations, and potentially at the Holyoke station location (not included as part of this project). The potential for transit-oriented development would support plans made by both cities to revitalize their respective downtown areas and create an activity center independent from automobile travel. It is more likely that the Proposed Project would encourage transit-oriented development, which tends to make it easier for residents to live closer to destinations such as employment and shopping.

A detailed economic analysis was conducted to identify the economic development potential related to rail improvements projected beyond the scope of this Project (see **Appendix E**). The two future scenarios examined for consideration of economic development impacts were Enhanced and Commuter Service. Enhanced passenger rail service assumes approximately 5 to 6 daily trains in each direction. Commuter service assumes providing more frequent service particularly during the morning and evening rush hours. Both of these scenarios are expected to generate induced economic development, and as can be seen in **Table 3.5.1–1**, aggregate results indicate a most likely result of about 2,700 jobs and 7,200 population in the Pioneer Valley by 2030 under the Enhanced scenario with just over 5,500 jobs and 13,400 population in the Commuter scenario. As shown, the economic development impacts are not immediate as the results are significantly lower for 2015, reflecting the time needed to fully realize and leverage the economic development opportunities provided by rail. Almost 70% of the job impact is in the four station cities (Springfield, Holyoke, Northampton, and Greenfield) in the Enhanced scenario with 42% of the population effect, roughly consistent with current development patterns. The Commuter scenario has a slightly lower share of jobs and population in the four station cities as the effects are felt a bit more broadly throughout the region.

Table 3.5.1-1 Summary Induced Employment and Population Results by Scenario

	Enhanced				Commuter			
	Employment		Population		Employment		Population	
	2015	2030	2015	2030	2015	2030	2015	2030
Greenfield	32	128	61	243	80	321	159	634
Northampton	177	707	307	1,227	222	889	361	1,444
Holyoke	65	260	131	522	152	609	256	1,022
Springfield	189	754	250	998	378	1,510	502	2,006
Rest of Franklin County	38	153	187	746	99	396	451	1,802
Rest of Hampshire County	88	352	452	1,806	206	823	671	2,682
Rest of Hampden County	87	349	416	1,662	242	967	959	3,837
TOTAL	**676**	**2,703**	**1,804**	**7,204**	**1,379**	**5,515**	**3,359**	**13,427**

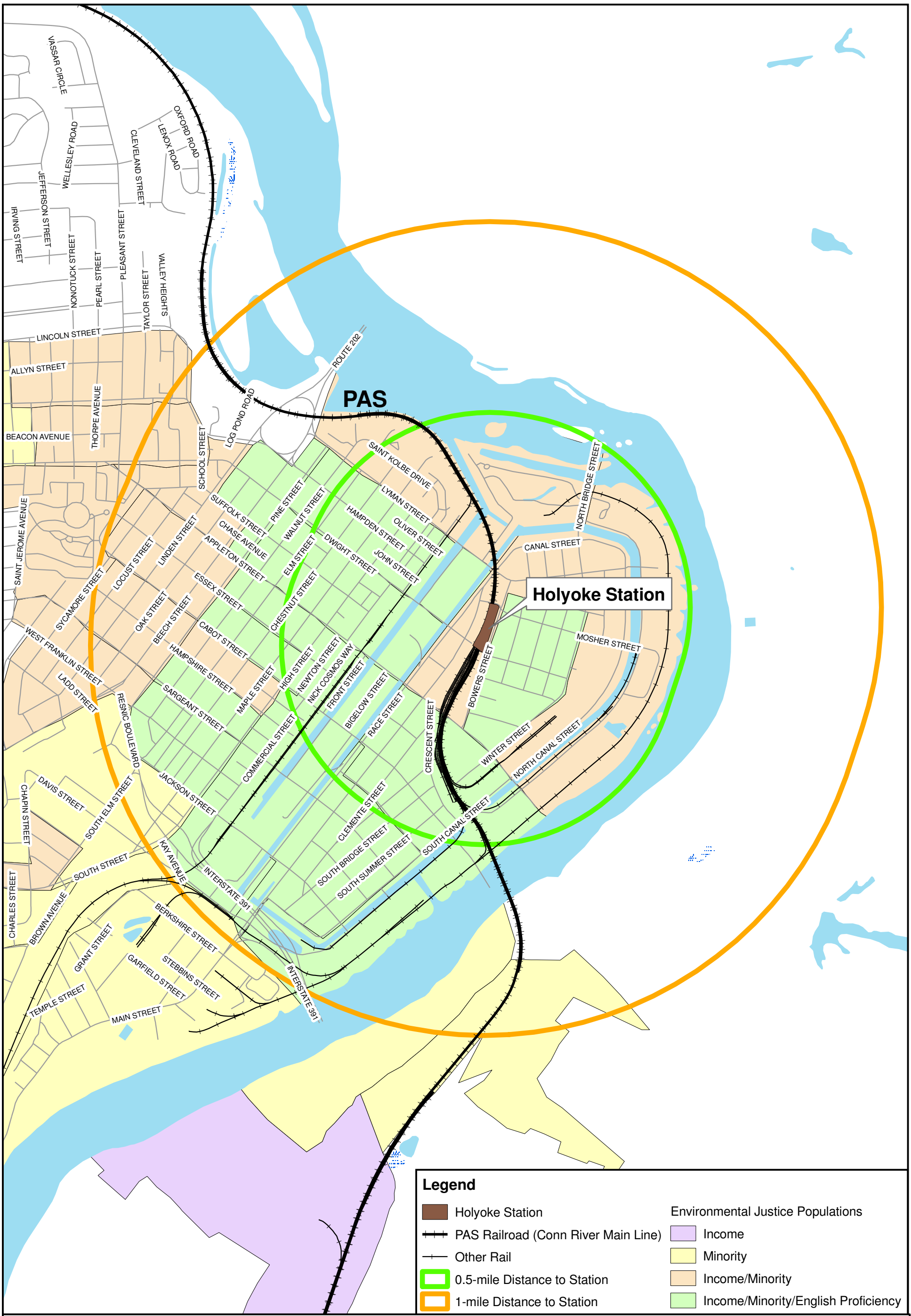
3.5.2 Cumulative Impacts

The consideration of cumulative effects consists of an assessment of the total effect on a resource, ecosystem, or community from past, present, and future actions that have altered the quantity, quality, or context of those resources within a broad geographic scope. Under the CEQ regulations, cumulative effects are defined as "… the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or persons undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7). The cumulative effects analysis considers the aggregate effects of direct and indirect impacts – from federal, non-federal, public, or private actions – on the quality of a resource.

The intent of the cumulative-effect analysis is to determine the magnitude of significance of cumulative effects, both beneficial and adverse, and to determine the contribution of the proposed action to those aggregate effects. Contributions to cumulative effects associated with the action alternative on the resources analyzed would be limited to those derived from the direct and secondary impacts of the action.

The planned Hartford High Speed Rail Corridor Feasibility Study will look at establishing better connectivity and providing better transportation access to the Boston area. The study area corridor is 62 miles of existing rail line, which is owned and operated by The National Railroad Passenger Corporation (Amtrak), beginning in New Haven at Union Station, continuing through several towns and the cities of Meriden and Hartford, and ending at Union Station in Springfield, Massachusetts. This project would likely promote economic development in Springfield and Western Massachusetts.

Relocation of the Vermonter onto the PAS Connecticut River Line creates the potential for a station at Holyoke. A station at Holyoke would provide economic development benefits for Holyoke plus improved access to passenger rail service. A station at Holyoke would also benefit environmental justice populations in that community (see **Figure 3.5-1**).


PAS
Holyoke Station
VASSAR CIRCLE
WELLESLEY ROAD
OXFORD ROAD
LENOX ROAD
CLEVELAND STREET
JEFFERSON STREET
IRVING STREET
NONOTUCK STREET
PEARL STREET
PLEASANT STREET
TAYLOR STREET
VALLEY HEIGHTS
LINCOLN STREET
ALLYN STREET
BEACON AVENUE
THORPE AVENUE
SCHOOL STREET
LOG POND ROAD
ROUTE 202
SAINT KOLBE DRIVE
LYMAN STREET
HAMPDEN STREET
OLIVER STREET
NORTH BRIDGE STREET
CANAL STREET
MOSHER STREET
BOWERS STREET
CRESCENT STREET
WINTER STREET
NORTH CANAL STREET
SUFFOLK STREET
PINE STREET
WALNUT STREET
CHASE AVENUE
APPLETON STREET
ELM STREET
DWIGHT STREET
JOHN STREET
CHESTNUT STREET
ESSEX STREET
CABOT STREET
HAMPSHIRE STREET
HIGH STREET
NEWTON STREET
NICK COSMOS WAY
FRONT STREET
BIGELOW STREET
RACE STREET
MAPLE STREET
SARGEANT STREET
COMMERCIAL STREET
SAINT JEROME AVENUE
LOCUST STREET
LINDEN STREET
SYCAMORE STREET
OAK STREET
BEECH STREET
WEST FRANKLIN STREET
LADD STREET
RESNIC BOULEVARD
JACKSON STREET
DAVIS STREET
SOUTH ELM STREET
CHAPIN STREET
CLEMENTE STREET
SOUTH BRIDGE STREET
SOUTH SUMMER STREET
SOUTH CANAL STREET
KAY AVENUE
SOUTH STREET
INTERSTATE 391
BROWN AVENUE
CHARLES STREET
BERKSHIRE STREET
GRANT STREET
GARFIELD STREET
STEBBINS STREET
TEMPLE STREET
MAIN STREET
Legend
Holyoke Station
PAS Railroad (Conn River Main Line)
Other Rail
0.5-mile Distance to Station
1-mile Distance to Station
Environmental Justice Populations
Income
Minority
Income/Minority
Income/Minority/English Proficiency
N
Scale: 1 Inch = 1,250 Feet
0 625 1,250 Feet
NOTE: Environmental Justice Data from Massachusetts Office of Geographic and Environmental Information (MassGIS), based on 2000 U.S. Census datalayers.
Prepared By: HDR
EOT Executive Office of Transportation
Knowledge Corridor - Restore Vermonter
Springfield to East Northfield, Massachusetts
Holyoke Environmental Justice Populations
Figure 3.5-1

Springfield is planning revitalization of the existing Springfield Rail Station to advance a transportation project that will potentially revitalize the station and the surrounding area. Springfield also conducted a study on bus service along the city's Main Street to improve transit mobility within the city. Improved bus service would better serve the residents in Springfield and assist in the PVPC's goal to provide alternatives to automobile travel in the region.

Most areas adjacent to the PAS Connecticut River Line right-of-way consist of higher-density development with mixed residential, business, institutional, and industrial space. This is especially true for Greenfield and Northampton, where stations are proposed. PVPC has worked with municipalities within the study area and actively promotes planning activities that support mixed use and transit-oriented development to reduce dependency on automobile travel. While some municipal planning documents may not explicitly address rail transit on the PAS Connecticut River Line right-of-way, all the plans include public transit (bus, para-transit, and/or rail) in their land-use and transportation system plans and encourage transit-friendly development.

The Proposed Project does not include enhanced passenger rail service (defined as increased frequency of service) or commuter rail service. However, the improvements to the PAS Connecticut River line and the relocation of the Vermonter passenger rail service to the line opens the door for enhanced rail service and commuter rail service which would otherwise not occur. EOT has developed a Service Development Plan for the Knowledge Corridor that considers the adding of additional trains to this line in the future. EOT recognized that further planning, negotiations with the other state partners, the railroads, and the identification of capital and operating funds is required before the additional service contemplated in the Service Development Plan is implemented. The improved rail service along the Knowledge Corridor is anticipated to provide employment and population impacts, the level of which will depend upon many factors, including the level of service, the timeframe in which the service is restored, and the region's ability to leverage rail improvements.

Regionally, the additional rail service provided by the potential relocation of the Vermonter would increase the number of passengers using transit, which would decrease the number of vehicle trips within the Pioneer Valley region between White River Junction, VT, and Springfield, MA, and into Connecticut. This would reduce vehicle miles traveled, congestion, and travel times throughout the region, particularly during the morning and evening rush hours.

Furthermore, the reduction in vehicle miles traveled would improve mobility throughout Pioneer Valley, which would in turn support economic growth in the project study area and the region overall. Transit creates statistically measurable economic value for communities, and these benefits extend to both transit users and non-users. This value appears in terms of increased land values and rents due to the demand for residential and commercial space in transit-oriented areas. The projected cumulative effect of transit projects on downtown and suburban economic development potential can be in the hundreds of millions of dollars (Lewis 2007).

4.0 COORDINATION AND CONSULTATION

Coordination and consultation with agencies, stakeholder groups and the public was initiated early in the PVPC Study to incorporate comments and concerns into the development and analysis of the project purpose and need, alternatives and potential resultant environmental impacts.

Coordination included stakeholder meetings, agency briefings, and public meetings presentations. Agency coordination included local government, state and federal agencies as appropriate. Because the study area extends to the Massachusetts state line, both north and south directions, agency outreach was extended to Vermont and Connecticut. Project coordination involved the following agencies and right-of-way representatives:

- New England Central Railroad
- Pan Am Railroad
- CSX Railroad
- Amtrak
- Vermont Agency of Transportation
- PVPC
- EOT
- Connecticut Department of Transportation
- New England Association of Regional Councils (NEARC)

In addition, a Technical Advisory Committee (TAC) was invited to review and respond to material and findings generated by the Study. The TAC is composed of advisors to the project, including railroads, transportation providers, political representatives, government agencies, and major businesses. Participants in TAC activities included representatives of the following groups:

- City of Holyoke Office of Planning and Economic Development
- Amtrak
- Pioneer Valley Transit Authority
- Windham Regional
- Franklin Regional Council of Government
- Pioneer Valley Railroad
- Office of Congressman John Olver
- Economic Development Council of Western Massachusetts
- Pan Am Railway
- Northampton Economic Development
- Executive Office of Transportation

Project meetings were held throughout the study process as indicated in **Table 4.1** below.

Table 4.1 Project Meetings

Meeting	Date
TAC Meeting	June 29, 2009
Public Meeting	May 27, 2009
Public Meeting	May 19, 2009
Public Meeting	May 20, 2009
TAC Meeting	April 15, 2009
TAC Meeting	November 19, 2008
NEARC Meeting	October 25, 2008
TAC Meeting	September 24, 2008

Public meetings for the study were held in Northampton and Springfield, MA and Bellow Falls, VT to ensure that input from residents in various locations is included in the project findings. In addition, a project website is set up to facilitate distribution of project updates, meeting notifications and collect comments on study activities. The PVPC is hosting the website at http://www.pvpc.org/corridor/index.html .

Public comments were collected at the meetings and received through mail and the above mentioned website. **Figure 4.1** gives an overview of input received through public involvement activities.

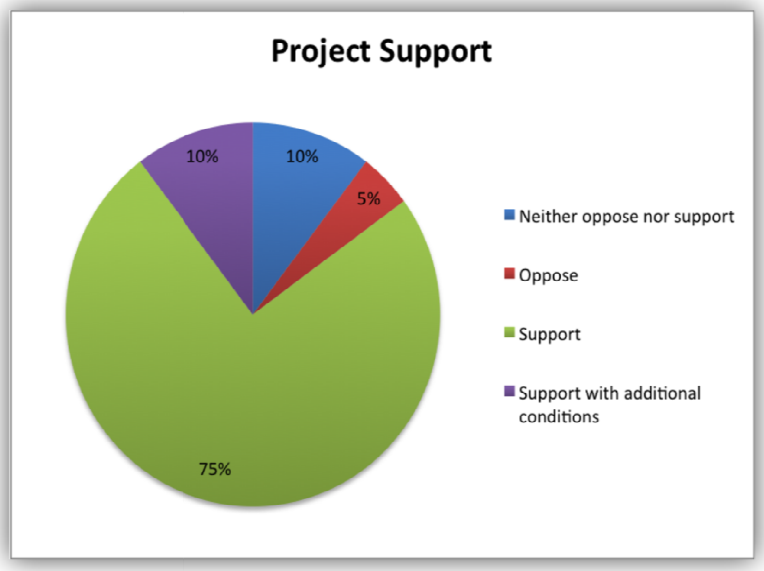


Figure 4.1 Project Support from General Public

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M E M O R A N D U M

Date: August 13, 2009

To: HDR, Inc.

From: Epsilon Associates, Inc.

Subject: Appendix A Air Quality

A1. Introduction and Project Description

The Massachusetts Executive Office of Transportation and Public Works (EOT), in conjunction with the Pioneer Valley Planning Commission (PVPC), Vermont Agency of Transportation (Vtrans), Pan Am Southern Railroad (PAS), and Amtrak, is proposing to relocate the Amtrak intercity passenger train, known as the Vermonter, from the New England Central Railroad back to its former route on the Pan Am Southern Railroad between Springfield and East Northfield in Massachusetts. The Vermonter operates daily between St. Albans, Vermont and Washington, D.C. The routing of the Vermonter in Vermont and south of Springfield would remain unchanged.

It is anticipated that initial service would include station stops at the former Amtrak station at Northampton and the new intermodal station at Greenfield, with a potential for additional stations in the future.

The project would include improvements to the existing Pan Am Southern rail line, including crosstie replacement, rail replacement, rehabilitation of grade crossings, reactivation of passing sidings and portions of double track, upgrading of switches, improvements to signal and communications systems, surfacing and alignment of track, and improvements to bridges and station platforms.

The Project improvements would occur within the existing right-of-way owned by the Pan Am Southern. The Project does not involve any acquisition of additional right-of-way.

The Proposed Project does not involve any additional ballast or fill material to be placed beyond the existing limits of ballast or fill. As such, there would be no culvert repair or replacement. There will be no in-water work in federal or state regulated wetlands or waterways.

The Project does not involve clearing or grading activity.

Since the project has the potential to affect air quality in the region, an analysis was performed to estimate impacts that might result from the proposed relocation of the Amtrak "Vermonter" line. The analysis was performed to address the requirements set forth in both 40 CFR 93, with respect to Conformity, and 40 CFR 50, with respect to health-based air quality standards.

A2. Regulatory Requirements

General and Transportation Conformity

Section 176 (c) of the Clean Air Act requires that any entity of the federal government that engages in, supports, or in any way provides financial support for, licenses or permits, or approves any activity must demonstrate that the action conforms to the State Implementation Plan (SIP). In this context, conformity means that such federal actions must be consistent with a SIP's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of those standards. The general conformity regulations apply to a federal action in nonattainment and maintenance areas if the total of direct and indirect criteria pollutant emissions from the action equals or exceeds the *de minimis* amounts or the action is determined to be regionally significant. The transportation conformity regulations apply to transportation plans, programs, and projects developed, funded, or approved by the Federal Highway Administration (FHWA) or the Federal Transit Administration (FTA) and sponsored by the local metropolitan planning organization (MPO). Elements of the project that would require funding or approval of either the FHWA or the FTA must be part of a conforming regional transportation plan (RTP) or a regional transportation improvement program (TIP) prepared by the MPO; in this case, the PVPC. The project proponent is working with the PVPC to ensure that data developed for the project is taken into consideration in the preparation of future RTP and TIP.

A conformity determination demonstrates that the total emissions projected for a plan or TIP are within the emissions limits ("budgets") established by the SIP, and that transportation control measures (TCMs) in EPA-approved SIPs are implemented in a

timely fashion. In certain cases, conformity may be demonstrated using other EPA-approved tests, such as before a state has approved or found a motor vehicle emissions budget adequate for conformity purposes.

Ambient Air Quality Standards

The 1970 Clean Air Act was enacted by Congress to protect the health and welfare of the public from the adverse effects of air pollution. As required by the Clean Air Act, EPA has promulgated NAAQS for the following criteria pollutants: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), ozone (O3), and lead (Pb). The Massachusetts Department of Environmental Protection (MassDEP) has also promulgated these standards into its SIP. The NAAQS/MAAQS are listed in Table A-1.

The NAAQS presented in Table A-1 specify concentration levels for various averaging times. The NAAQS includes both "primary" and "secondary" standards. The primary standards are intended to protect human health; whereas, the secondary standards are intended to protect public welfare from known or anticipated adverse effects associated with the presence of air pollutants, such as damage to vegetation.

Table A-1 National and Massachusetts Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS/MAAQS ($\mu g/m^3$)	
		Primary	Secondary
NO_2	Annual[1]	100	Same
	1-hour [2]	320	None
SO_2	Annual [1]	80	None
	24-hour [2]	365	None
	3-hour [2]	None	1,300
PM_{10}	Annual [6]	Revoked (EPA) 50 (MAAQS)	Same
	24-hour [3]	150	Same
$PM_{2.5}$	Annual [4]	15	Same
	24-hour [5]	35	Same
CO	8-hour [2]	10,000	Same
	1-hour [2]	40,000	Same
Ozone	8-hour [3]	235	Same
Pb	3-month [1]	1.5	Same

The NAAQS also reflect various durations of exposure. The short-term periods (24 hours or less) refer to exposure levels not to be exceeded more than once a year. Long-term periods refer to limits that cannot be exceeded for exposure averaged over three months or longer.
The inhalable particulate (PM10) NAAQS were promulgated on July 1, 1987 at the federal level with the intent of replacing the existing standards limiting ambient levels of Total Suspended Particulate (TSP). EPA also promulgated a new Fine Particulate (PM2.5) NAAQS effective December 2006 with an annual standard of 15 µg/m3 and the 24-hour standard of 35 µg/m3.

Local Ambient Air Quality

To estimate ambient pollutant levels representative of the area, the most recent (2005 to 2008) air quality monitor data reported on the U.S. EPA's AIRData website (http://www.epa.gov/air/data), were obtained. The closest monitors were identified and examined for appropriateness.

The Clean Air Act allows for one exceedance per year of the CO and SO_2 short-term NAAQS per year. The highest second-high accounts for the one exceedance. The 24-hour PM_{10} standard is not to be exceeded more than once per year on average over 3 years. To attain the 24-hour $PM_{2.5}$ standard, the 3-year average of the 98th percentile of 24-hour concentrations must not exceed 35 µg/m3. For annual averages, the average of the highest yearly observations was used as the background concentration.

Local concentrations were determined from the closest available monitoring stations to the area, located in Ware, Springfield, and Chicopee. A summary of the local air quality concentrations is presented in Table A-2.

Table A-2 Observed Ambient Air Quality Concentrations and Selected Background Levels

Pollutant	Averaging Period	Station	2006	2007	2008	Background Level	NAAQS
SO_2 ($\mu g/m^3$)	3-Hour	WARE	36.54	39.15	39.15	39.15	1,300
	24-Hour	WARE	26.1	28.71	28.71	28.71	365
	Annual	WARE	5.22	7.83	5.22	7.83	80
CO (ppm)	1-Hour	SPFD	3.1	2.1	3.4	3.4	35
	8-Hour	SPFD	2.4	1.3	2.5	2.5	9
NO_2 ($\mu g/m^3$)	Annual	WARE	7.52	7.52	9.40	9.40	100
Ozone (ppm)	1-Hour	WARE	0.13	0.125	0.105	0.13	0.12
	8-Hour	WARE	0.103	0.102	0.082	0.103	0.08

Pollutant	Averaging Period	Station	2006	2007	2008	Background Level	NAAQS
PM_{10} ($\mu g/m^3$)	24-Hour	WARE	31	29	25	31	150
	Annual	WARE	11	11	10	11	50
$PM_{2.5}$ ($\mu g/m^3$)	24-Hour	CHIC	28.9	28.8	26.6	28.1	35
	Annual	CHIC	8.83	9.88	9.24	9.32	15

Notes: Background level for $PM_{2.5}$ is the average concentration of the 98^{th} percentile for three years.
WARE = Quabbin Summit, Ware, MA; SPFD = Liberty P-Lot, Springfield, MA; CHIC = Anderson Rd, AFB Chicopee, MA.

The background level for 3-hour SO_2 compared to the NAAQS is low at 3%. Comparing the 24-hour SO_2 and annual SO_2 background levels also result in relatively low percentages at 7.8% and 9.8% respectively. The observed background level compared to the NAAQS for the 1-hour CO is approximately 9.7%. A slightly higher percentage is seen when comparing the 8-hour CO concentration to the NAQQS at 27.7%. Annual NO_x background level compared to the NAAQS is 9.4%.

Observed ozone background levels for both the 1-hour and 8-hour averaging periods were seen to be relatively high when compared to the NAAQS at 108.3% and 128.8% respectively. This was the only observed pollutant to have percentages above 100% when compared to the NAAQS concentrations. Observed 24-hour PM_{10} background concentration is 20.6% of the NAAQS. While the annual PM_{10} concentration compared to the NAAQS was seen to be 22%. The $PM_{2.5}$ comparisons of background concentrations to the NAAQS concentrations were seen to be much higher for the 24-hour $PM_{2.5}$ at 80.3% and the annual $PM_{2.5}$ at 62.1%.

The review of local air quality in the region confirms that the area is in attainment of ambient air quality standards for all pollutants except ozone.

A3. Technical Approach

The air quality analysis focuses on the relocation of a single Amtrak P-42 locomotive from one existing rail line to another existing rail line. The relocation will result in the train's traveling a shorter distance and at a higher average speed. In addition to the locomotive, there is currently a commuter bus running twice daily from Amherst to Northampton which will mitigate impacts to the loss of rail service in Amherst. Since this bus operates in both the existing and proposed cases, and its operation is unchanged, it is assumed that it adds no net impacts to the proposed case.

This analysis quantitatively assesses the emissions changes resulting from the relocation and qualitatively assesses changes in the resulting pollutant concentrations that could be expected from these emissions.

A4. Air Quality Assessment

Methodology

Air pollutants emitted by locomotives include pollutants that are created by secondary reactions during the combustion process (NO_2 and SO_2), as well as the products of incomplete combustion (CO and PM_{10}). Emission factors are presented in Tables A-3 through A-6. The criteria pollutant emission factors for locomotives (U.S. EPA, 1997) are provided in Table A-3. (Even though emission factors are provided for oxides of nitrogen (NO_x), these emissions are assumed to be converted to NO_2 in the atmosphere for comparison to applicable health and safety thresholds.)

Table A-3 Locomotive Emission Factors

	THC		CO		NO_X		PM_{10}	
	g/bhp/hr	**g/gal**	**g/bhp/hr**	**g/gal**	**g/bhp/hr**	**g/gal**	**g/bhp/hr**	**g/gal**
Tier 0 (Manufacture Year 1973-2001)								
Line Haul	0.48	10	1.28	26.6	8.6	178	0.32	6.7
Yard	1.01	21	1.83	38.1	12.6	262	0.44	9.2
Tier 1 (Manufacture Year 2002-2004)								
Line Haul	0.47	9.8	1.28	26.6	6.7	139	0.32	6.7
Yard	1.01	21	1.83	38.1	9.9	202	0.44	9.2
Tier 2 (Manufacture Year 2004-)								
Line Haul	0.26	5.4	1.28	26.6	5.0	103	0.17	3.6
Yard	0.52	11	1.83	38.1	7.3	152	0.21	4.3

g/bhp/hr = grams per brake horsepower per hour
g/gal = grams per gallon
THC = total hydrocarbons
CO = carbon monoxide
NO_x = oxides of nitrogen (assumed to be entirely converted to nitrogen dioxide, NO_2, in the atmosphere)
PM_{10} = particulate matter less than 10 microns in diameter

EPA recommends that the conversion from total hydrocarbons (THC) to volatile organic compounds (VOC) be made using the correction factor for large nonroad diesel engines. This conversion is shown to be as follows:

VOC = THC ×1.005

The emissions particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) will also be evaluated. EPA's Emissions Inventory Improvement Program (EIIP) has produced a "one-page" information sheet containing emission factors for $PM_{2.5}$. This document provides a $PM_{2.5}$ emission factor of 6.03 grams per gallon (g/gal) for all locomotive line haul operations. The California Air Resources Board (CARB) has also compiled diesel PM emission factors for locomotives from a variety of sources, including U.S. EPA's Locomotive Emission Standards Regulatory Support Document, April 1998, and locomotive engine manufacturers. These data were reviewed, and the higher of either the EIIP emission factor or the CARB emission factor was used to represent $PM_{2.5}$. In addition, the emission rates of diesel PM alone were calculated based on the CARB study.

SO_2 is also a product of diesel combustion, due to the sulfur content of the fuel. An SO_2 emission factor was developed for the National Emissions Inventory (NEI) (Pechan, 2005) by multiplying the percent sulfur content in fuel, 0.27% for the United States except California, by the molecular weight of SO_2, and by the density of the diesel fuel, which is 7.05 pounds per gallon (lbs/gal), and by a conversion factor, 0.97753, as noted in the equation below:

$$EF_{SO2} = C_S \times D_{diesel} \times \frac{MW_{SO2}}{MW_S} \times 453.59 \times k$$

Where:

EF_{SO2} = SO_2 emission factor for locomotive (g/gal)
C_S = Fuel Sulfur concentration (fraction by weight)
D_{diesel} = Density of diesel fuel (lb/gal)
MW_{SO2} = molecular weight of SO_2 (64.1 grams per mole [g/mol])
MW_S = molecular weight of S (32.06 g/mol)
453.59 = g per lb
k = conversion factor

California requires the use of low-sulfur diesel fuel, and a sulfur concentration of 0.012% can be used for locomotives receiving fuel in California. The results of this calculation are SO_2 emission factors of 0.75 g/gal for California fuel, and 16.88 g/gal for the remainder of the United States.

Hazardous air pollutants (HAP) emission factors were also developed for the NEI. Emission factors of hazardous metals in diesel exhaust were expressed in pounds of metal per gallon of diesel fuel combusted. These factors are shown in Table A-4.

Table A-4 Locomotive HAP Metal Emission Factors

Pollutant	Emission Factor (lb/gal)	Emission Factor (g/gal)
Beryllium	4.2E-07	1.9E-04
Cadmium	4.2E-07	1.9E-04
Lead	1.3E-06	5.9E-04

The NEI also presents a number of HAP locomotive emission factors available by locomotive engine type: 2-stroke and 4-stroke (see Table A-5). Again, since California uses different diesel fuel than the remainder of the United States, there are HAP emission factors specific to locomotives fueling in California. The Amtrak P-42 engine is a 45° four-stroke V16 engine so the four-stroke emission factors in Table A-5 were used.

Table A-5 Locomotive HAP Emission Factors for 2- and 4-stroke Engines

	2-Stroke	4-Stroke	2-Stroke	4-Stroke
	(US except CA)	(US except CA)	(CA only)	(CA only)
Pollutant	g/gal	g/gal	g/gal	g/gal
1,3-Butadiene	0.02836	0.0413511	0.0246138	0.0349507
Acetaldehyde	0.206756	0.1469518	0.2106938	0.1886544
Acrolein	0.037413	0.0178725	0.0374129	0.0417025
Benzene	0.018903	0.0409082	0.0147683	0.0422983
Chromium	3.36E-05	5.864E-05	7.871E-05	4.387E-05
Formaldehyde	0.454862	0.3852521	0.4194185	0.4487989

Pechan & Associates also reported HAP emission factors based on speciation profile research. Table A-6 presents the amounts of HAPs emitted based on VOC or PM_{10} emissions (in tons of HAP per ton of total VOC or PM_{10} emissions).

For conservatism, all locomotives were assumed to be Tier 0 since the P-42 engines were manufactured between 1992 and 2001.

Emissions from locomotives are calculated using the following simple equation:

Emission rate = fuel consumption rate x emission factor

The use of this method is based on the assumption that the locomotives in the inventory will consume an average amount of fuel within a large inventory area, typically a county, air quality management district, or a similar regional delineation. The project area consists of two lengths of track, one 60.4 miles long and one 49 miles long.

Table A-6 Locomotive HAP Emission Factors Speciation Profiles

Pollutant	Speciation Profile (US except CA) (ton HAP/ton PM_{10})	Speciation Profile (CA) (ton HAP/ton PM_{10})	Speciation Profile (All US) (ton HAP/ton VOC)	Speciation Profile (All US) (ton HAP/ton PM_{10})
2,2,4-Trimethylpentane	-	-	0.00224	-
Ethylbenzene	-	-	0.002	-
n-Hexane	-	-	0.0055	-
Propionaldehyde	-	-	0.0061	-
Styrene	-	-	0.0021	-
Toluene	-	-	0.0032	-
Xylene	-	-	0.0048	-
Manganese	-	-	-	0.00000204
Nickel	-	-	-	0.00000655
Benzo(a)anthracene	0.0000160	0.0000121	-	-
Benzo(a)pyrene	0.0000027	0.0000044	-	-
Benzo(b)fluoranthene	0.0000064	0.0000044	-	-
Benzo(k)fluoranthene	0.0000052	0.0000044	-	-
Chrysene	0.0000119	0.0000092	-	-

Pollutant	Speciation Profile (US except CA) (ton HAP/ton PM_{10})	Speciation Profile (CA) (ton HAP/ton PM_{10})	Speciation Profile (All US) (ton HAP/ton VOC)	Speciation Profile (All US) (ton HAP/ton PM_{10})
Dibenz(a,h)anthracene	0.0000000	0.0000000	-	-
Indeno(1,2,3-cd)pyrene	0.0000027	0.0000033	-	-
Acenaphthene	0.0000306	0.0000080	-	-
Acenaphthalene	0.0004275	0.0002182	-	-
Anthracene	0.0001009	0.0000535	-	-
Benzo(ghi)perylene	0.0000031	0.0000044	-	-
Fluoranthene	0.0000746	0.0000601	-	-
Fluorene	0.0001407	0.0000619	-	-
Napthalene	0.0025756	0.0018505	-	-
Phenanthrene	0.0005671	0.0002822	-	-
Pyrene	0.0001054	0.0000771	-	-

US = United States
CA = California
HAP = hazardous air pollutants
VOC = volatile organic compounds
PM_{10} = particulate matter less than 10 microns in diameter

Since fuel consumption rates at idle and typical transit speeds were available, the following methodology was used:

$$E = EF \times FCR \times T$$

Where:

E = emissions of pollutant from locomotive (grams [g])
EF = emission factor for locomotive (g/gal)
FCR = fuel consumption rate of locomotive at idle or transit speed notch setting (gallons per minute [gal/min])
T = time within emissions calculation zone of locomotive (minutes [min])

The time within the emissions calculation zone was calculated using the relationship between average transit speed and travel length for transit operations. This methodology was also used for SO_2, $PM_{2.5}$ and HAP emissions whose factors are only available in units of g/gal.

Fuel consumption rates of the P-42 passenger locomotive were used. These rates are specified in Table A-7. The "Idle" notch setting was used for stationary equipment, while notch setting 6 was used for long term transit for passenger locomotives.

Table A-7 Locomotive Fuel Consumption Rates

Notch Setting	P-42 Fuel Consumption (gallons per hour)
8	172
7	172
6	155
5	127
4	99
3	79
2	54
1	41
Idle	35
Low Idle	N/A
DB	15.9
From HEP300kW - from AMTRAK - System General Road Foreman Notice: 2009–46; 2/5/09	

Emissions Results

Emissions are shown to decrease slightly, mainly due to the shorter distance of the proposed rail line and the increased speed at which the train will travel. The shorter distance and increased speed result in a significantly shorter time that the locomotives will be in use.

Table A-8 presents the results of the emissions analysis. Overall, emissions are expected to decrease approximately 28% due to the changes in speed and distance. Emissions of NOx are expected to decrease 9 tons per year (from 32 tpy to 23 tpy). Emissions of CO are expected to decrease 1.3 tons per year (from 4.9 tpy to 3.6 tpy). Emissions of all other criteria pollutants, metals, and hazardous air pollutants are expected to decrease less than 1 tpy each.

Actual calculations are shown in Attachment A-1.

Table A-8 Net Emission Results

Criteria Pollutants	Net Emissions (tons per year)
THC	-0.507
VOC	-0.510
CO	-1.350
NO_X	-9.032
SO_2 (other US)	-0.857
SO_2 (CA only)	-0.038
PM_{10}	-0.340
$PM_{2.5}$	-0.306
Diesel PM	-0.195

Hazardous Air Pollutants	Net Emissions (tons per year)
Beryllium	-9.641E-06
Cadmium	-9.641E-06
Lead	-2.994E-05
1,3 Butadiene	-2.098E-03
Acetaldehyde	-7.457E-03
Acrolein	-9.069E-04
Benzene	-2.076E-03
Chromium	-2.976E-06
Formaldehyde	-1.955E-02
2,2,4-Trimethylpentane	-1.137E-04
Ethylbenzene	-1.015E-04
n-Hexane	-2.791E-04
Propionaldehyde	-3.095E-04
Styrene	-1.066E-04
Toluene	-1.624E-04
Xylene	-2.436E-04
Manganese	-1.035E-07
Nickel	-3.324E-07
Benzo(a)anthracene	-8.119E-07
Benzo(a)pyrene	-2.233E-07

Hazardous Air Pollutants	Net Emissions (tons per year)
Benzo(b)fluoranthene	-3.248E-07
Benzo(k)fluoranthene	-2.639E-07
Chrysene	-6.038E-07
Dibenz(a,h)anthracene	0.000E+00
Indeno(1,2,3-cd)pyrene	-1.675E-07
Acenaphthene	-1.553E-06
Acenaphthalene	-2.169E-05
Anthracene	-5.120E-06
Benzo(ghi)perylene	-2.233E-07
Fluoranthene	-3.785E-06
Fluorene	-7.140E-06
Napthalene	-1.307E-04
Phenanthrene	-2.878E-05
Pyrene	-5.348E-06
Total HAPs	**-3.37E-02**

Conformity Determination

A federal action is considered *de minimis* for General Conformity if its emissions are below those outlined in 40 CFR 93.153(b)(1) or is an activity listed in 93.153(c)(2). Typical emission thresholds in maintenance areas are 100 tons of pollutant per year, less in nonattainment areas with the threshold determined by the severity of the nonattainment designation. The *de minimis* thresholds are shown in Tables A-9 and A-10 for nonattainment and maintenance areas, respectively

If an action is not *de minimis*, then air quality analyses must be performed for the year of highest emissions, in addition to the expected year of attainment or the farthest year designated in the maintenance plan.

The proposed relocation area is in attainment of NAAQS for all pollutants except ozone (Subpart 2/Moderate). Massachusetts is part of the ozone transport region. Since emissions from the relocation are below all applicable *de minimis* thresholds, the project is exempt from the requirements of General Conformity.

Table A-9 General Conformity *De Minimis* Thresholds – Nonattainment Areas

Pollutant	Tons/year
Ozone (VOC's or NO_X):	
Serious Nonattainment Areas	50
Severe Nonattainment Areas	25
Extreme Nonattainment Areas	10
Other ozone Nonattainment Areas outside an ozone transport region	100
Other ozone Nonattainment Areas inside an ozone transport region:	
VOC	50
NOX	100
Carbon monoxide: All Nonattainment Areas	100
SO_2or NO_2: All Nonattainment Areas	100
PM–10:	
Moderate Nonattainment Areas	100
Serious Nonattainment Areas	70
$PM_{2.5}$:	
Direct emissions	100
SO2	100
NOX (unless determined not to be a significant precursor)	100
VOC or ammonia (if determined to be significant precursors)	100
Pb: All NAA's	25

Table A-10 General Conformity *De Minimis* Thresholds – Maintenance Areas

Pollutant	Tons/year
Ozone (NO_X, SO_2or NO_2):	
All Maintenance Areas	100
Ozone (VOC's):	
Maintenance areas inside an ozone transport region	50
Maintenance areas outside an ozone transport region	100
Carbon monoxide: All Maintenance Areas	100
PM–10: All Maintenance Areas	100
$PM_{2.5}$:	
Direct emissions	100
SO2	100

Pollutant	Tons/year
NOX(unless determined not to be a significant precursor)	100
VOC or ammonia (if determined to be significant precursors)	100
Pb: All Maintenance Areas	25

Transportation conformity is determined if the project is included in the appropriate TIP. If included, then the project is presumed to conform if appropriate PM control measures are implemented (40 CFR 93.117). One or both microscale ("hot spot") analyses of carbon monoxide (CO) and particulate matter (PM) is required to show no violations of the NAAQS for maintenance areas of those pollutants. If the project is not included in the TIP, it must be shown that the project meets an emissions budget, or that the emissions from the proposed action do not exceed the "baseline" emissions. Transportation control measures must be consistent with the current TIP, while the requirements of the microscale "hot spot" analysis are also fulfilled.

The proposed relocation of the Amtrak "Vermonter" line does not appear to be included in the most recent PVPC TIP. However, since the project results in a reduction in emissions from the baseline, the project is presumed to conform. In addition, no serious highway traffic impacts are expected; therefore no CO hot spots will result.

Conclusions

Due to the decrease in overall emissions of 28%, it can be expected that the overall air quality in the project's region would be improved.

Locomotives will average 40 to 50 mph while in motion, and the elapsed time at each of the planned stations is expected to be approximately 3 minutes. The shortest AAQS is a 1-hour averaging period. Therefore, it can be concluded that even in worst case conditions, a single locomotive will not be emitting at any location along the route for such a lengthy period as to adversely affect air quality and exceed any AAQS.

Finally, the project is presumed to conform to the General and Transportation Conformity requirements as promulgated in 40 CFR 93.

A5. References.

40 CFR 93, Determining Conformity of Federal Actions to State or Federal Implementation Plans.

40 CFR 81.322, Designation Of Areas For Air Quality Planning Purposes, Subpart C—Section 107 Attainment Status Designations, Massachusetts.

AMTRAK, System General Road Foreman Notice, NOTICE NUMBER: 2009 – 46 DATE: 2/5/09.

CARB, Roseville Rail Yard Study, October 14, 2004.

E.H. Pechan & Associates, Inc., Documentation For Aircraft, Commercial Marine Vessel, Locomotive, And Other Nonroad Components Of The National Emissions Inventory, Volume I – Methodology, February 10, 2005.

Personal Communication (Email), Mr. Vincent Tino, Epsilon Associates Inc, with Mr. James Spoetzel, Transit Safety Management, August 1, 2009.

U.S. EPA, AIRData website (http://www.epa.gov/air/data).

U.S. EPA, Emission Inventory Improvement Program, Technical Report Series, Volume 9, Particulate Emissions, (http://www.epa.gov/ttn/chief/eiip/techreport/volume09/locomotives.pdf).

U.S. EPA, Locomotive Emission Standards Regulatory Support Document, April 1998.

U.S. EPA, Technical Highlights Emission Factors for Locomotives, EPA420-F-97-051 December 1997.

Attachment A-1, Estimation of Pollutant Emissions

Estimation of Pollutant Emissions

Scenario: A
Description: Existing Vs Proposed Conditions - Amtrak train only

Railway Dimensions	Miles	Miles
Corridor Length:	60.4	49

	Train 1	Train 2	
Description:	AMTRAK	AMTRAK	
Engine Name:	P-42	P-42	
Number of Engines:	1	1	
Number of Trains per Day:	2	2	
Days/week:	7	7	
Moving Trains			
Number of Engines at Idle Throttle:	0	0	
Number of Engines at Moving Throttle:	-1	1	
Train avg. Speed:	41	46	mph
Idle throttle setting:	Idle	Idle	
Moving throttle setting:	6	6	
Idle Fuel Flow:	35	35	gal/hr
Moving Fuel Flow:	155	155	gal/hr
Estimated moving time in Corridor:	88.39	63.91	minutes
Stationary Trains			
Number of Engines at Idle Throttle:	-1	1	
Number of Engines at Non-Idle Throttle:	0	0	
Idle throttle setting:	Idle	Idle	
Non-Idle throttle setting:	Idle	Idle	
Idle Fuel Flow:	35	35	gal/hr
Non-Idle Fuel Flow:	35	35	gal/hr
Estimated stationary time in Corridor:	3.00	3.00	minutes/day

Total Emissions = Emissions from Train 1 + Emissions from Train 2

Emission Rate and Exposure Impact Calculations

Criteria Pollutants	Emission Factor Value	Unit	Train 1 Motion (g/day)	Train 1 Stationary (g/day)	Train 1 Total (g/day)	Train 1 Total (tpy)	Train 2 Motion (g/day)	Train 2 Stationary (g/day)	Train 2 Total (g/day)	Train 2 Total (tpy)	Total Emissions (tpy)
THC	10	g/gal	-4566.829	-35.000	-4601.829	-1.846	3302.174	35.000	3337.174	1.339	-0.507
VOC	10.05	=1.005 x THC	-4589.663	-35.175	-4624.838	-1.856	3318.685	35.175	3353.860	1.346	-0.510
CO	26.6	g/gal	-12147.766	-93.100	-12240.866	-4.912	8783.783	93.100	8876.883	3.562	-1.350
NO_x	178	g/gal	-81289.561	-623.000	-81912.561	-32.867	58778.696	623.000	59401.696	23.835	-9.032
SO_2 (other US)	16.88	g/gal	-7708.808	-59.080	-7767.888	-3.117	5574.070	59.080	5633.150	2.260	-0.857
SO_2 (CA only)	0.75	g/gal	-342.512	-2.625	-345.137	-0.138	247.663	2.625	250.288	0.100	-0.038
PM_{10}	6.7	g/gal	-3059.776	-23.450	-3083.226	-1.237	2212.457	23.450	2235.907	0.897	-0.340
$PM_{2.5}$	6.03	g/gal	-2753.798	-21.105	-2774.903	-1.113	1991.211	21.105	2012.316	0.807	-0.306
Diesel PM (Train 1-Motion)	3.85	g/gal	-1756.656		-1761.243	-0.707					-0.195
Diesel PM (Train 1-Stationary)	1.31	g/gal		-4.587							
Diesel PM (Train 2-Motion)	3.85	g/gal					1270.199		1274.787	0.511	
Diesel PM (Train 2-Stationary)	1.31	g/gal						4.587			
Hazardous Air Pollutants											
Beryllium	1.90E-04	g/gal	-8.677E-02	-6.650E-04	-8.743E-02	-3.508E-05	6.274E-02	6.650E-04	6.341E-02	2.544E-05	-9.641E-06
Cadmium	1.90E-04	g/gal	-8.677E-02	-6.650E-04	-8.743E-02	-3.508E-05	6.274E-02	6.650E-04	6.341E-02	2.544E-05	-9.641E-06
Lead	5.90E-04	g/gal	-2.694E-01	-2.065E-03	-2.715E-01	-1.089E-04	1.948E-01	2.065E-03	1.969E-01	7.900E-05	-2.994E-05
1,3 Butadiene	4.14E-02	g/gal	-1.888E+01	-1.447E-01	-1.903E+01	-7.635E-03	1.365E+01	1.447E-01	1.380E+01	5.537E-03	-2.098E-03
Acetaldehyde	1.47E-01	g/gal	-6.711E+01	-5.143E-01	-6.762E+01	-2.713E-02	4.853E+01	5.143E-01	4.904E+01	1.968E-02	-7.457E-03
Acrolein	1.79E-02	g/gal	-8.162E+00	-6.255E-02	-8.225E+00	-3.300E-03	5.902E+00	6.255E-02	5.964E+00	2.393E-03	-9.069E-04
Benzene	4.09E-02	g/gal	-1.868E+01	-1.432E-01	-1.883E+01	-7.554E-03	1.351E+01	1.432E-01	1.365E+01	5.478E-03	-2.076E-03
Chromium	5.86E-05	g/gal	-2.678E-02	-2.052E-04	-2.699E-02	-1.083E-05	1.936E-02	2.052E-04	1.957E-02	7.852E-06	-2.976E-06
Formaldehyde	3.85E-01	g/gal	-1.759E+02	-1.348E+00	-1.773E+02	-7.114E-02	1.272E+02	1.348E+00	1.286E+02	5.159E-02	-1.955E-02
2,2,4-Trimethylpentane	0.00224	ton/tonVOC	-1.023E+00	-7.840E-03	-1.031E+00	-4.136E-04	7.397E-01	7.840E-03	7.475E-01	2.999E-04	-1.137E-04
Ethylbenzene	0.002	ton/tonVOC	-9.134E-01	-7.000E-03	-9.204E-01	-3.693E-04	6.604E-01	7.000E-03	6.674E-01	2.678E-04	-1.015E-04
n-Hexane	0.0055	ton/tonVOC	-2.512E+00	-1.925E-02	-2.531E+00	-1.016E-03	1.816E+00	1.925E-02	1.835E+00	7.365E-04	-2.791E-04
Propionaldehyde	0.0061	ton/tonVOC	-2.786E+00	-2.135E-02	-2.807E+00	-1.126E-03	2.014E+00	2.135E-02	2.036E+00	8.168E-04	-3.095E-04
Styrene	0.0021	ton/tonVOC	-9.590E-01	-7.350E-03	-9.664E-01	-3.878E-04	6.935E-01	7.350E-03	7.008E-01	2.812E-04	-1.066E-04
Toluene	0.0032	ton/tonVOC	-1.461E+00	-1.120E-02	-1.473E+00	-5.909E-04	1.057E+00	1.120E-02	1.068E+00	4.285E-04	-1.624E-04
Xylene	0.0048	ton/tonVOC	-2.192E+00	-1.680E-02	-2.209E+00	-8.863E-04	1.585E+00	1.680E-02	1.602E+00	6.427E-04	-2.436E-04
Manganese	2.04E-06	ton/tonPM_{10}	-9.316E-04	-7.140E-06	-9.388E-04	-3.767E-07	6.736E-04	7.140E-06	6.808E-04	2.732E-07	-1.035E-07
Nickel	6.55E-06	ton/tonPM_{10}	-2.991E-03	-2.293E-05	-3.014E-03	-1.209E-06	2.163E-03	2.293E-05	2.186E-03	8.771E-07	-3.324E-07
Benzo(a)anthracene	0.000016	ton/tonPM_{10}	-7.307E-03	-5.600E-05	-7.363E-03	-2.954E-06	5.283E-03	5.600E-05	5.339E-03	2.142E-06	-8.119E-07
Benzo(a)pyrene	0.0000044	ton/tonPM_{10}	-2.009E-03	-1.540E-05	-2.025E-03	-8.124E-07	1.453E-03	1.540E-05	1.468E-03	5.892E-07	-2.233E-07
Benzo(b)fluoranthene	0.0000064	ton/tonPM_{10}	-2.923E-03	-2.240E-05	-2.945E-03	-1.182E-06	2.113E-03	2.240E-05	2.136E-03	8.570E-07	-3.248E-07
Benzo(k)fluoranthene	0.0000052	ton/tonPM_{10}	-2.375E-03	-1.820E-05	-2.393E-03	-9.602E-07	1.717E-03	1.820E-05	1.735E-03	6.963E-07	-2.639E-07
Chrysene	0.0000119	ton/tonPM_{10}	-5.435E-03	-4.165E-05	-5.476E-03	-2.197E-06	3.930E-03	4.165E-05	3.971E-03	1.593E-06	-6.038E-07
Dibenz(a,h)anthracene	0.000000	ton/tonPM_{10}	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Indeno(1,2,3-cd)pyrene	0.0000033	ton/tonPM_{10}	-1.507E-03	-1.155E-05	-1.519E-03	-6.093E-07	1.090E-03	1.155E-05	1.101E-03	4.419E-07	-1.675E-07
Acenaphthene	0.0000306	ton/tonPM_{10}	-1.397E-02	-1.071E-04	-1.408E-02	-5.650E-06	1.010E-02	1.071E-04	1.021E-02	4.097E-06	-1.553E-06
Acenaphthalene	0.0004275	ton/tonPM_{10}	-1.952E-01	-1.496E-03	-1.967E-01	-7.894E-05	1.412E-01	1.496E-03	1.427E-01	5.724E-05	-2.169E-05
Anthracene	0.0001009	ton/tonPM_{10}	-4.608E-02	-3.532E-04	-4.643E-02	-1.863E-05	3.332E-02	3.532E-04	3.367E-02	1.351E-05	-5.120E-06
Benzo(ghi)perylene	0.0000044	ton/tonPM_{10}	-2.009E-03	-1.540E-05	-2.025E-03	-8.124E-07	1.453E-03	1.540E-05	1.468E-03	5.892E-07	-2.233E-07
Fluoranthene	0.0000746	ton/tonPM_{10}	-3.407E-02	-2.611E-04	-3.433E-02	-1.377E-05	2.463E-02	2.611E-04	2.490E-02	9.989E-06	-3.785E-06
Fluorene	0.0001407	ton/tonPM_{10}	-6.426E-02	-4.925E-04	-6.475E-02	-2.598E-05	4.646E-02	4.925E-04	4.695E-02	1.884E-05	-7.140E-06
Napthalene	0.0025756	ton/tonPM_{10}	-1.176E+00	-9.015E-03	-1.185E+00	-4.756E-04	8.505E-01	9.015E-03	8.595E-01	3.449E-04	-1.307E-04
Phenanthrene	0.0005671	ton/tonPM_{10}	-2.590E-01	-1.985E-03	-2.610E-01	-1.047E-04	1.873E-01	1.985E-03	1.893E-01	7.594E-05	-2.878E-05
Pyrene	0.0001054	ton/tonPM_{10}	-4.813E-02	-3.689E-04	-4.850E-02	-1.946E-05	3.480E-02	3.689E-04	3.517E-02	1.411E-05	-5.348E-06
Total HAPS			-3.03E+02	-2.32E+00	-3.05E+02	-1.22E-01	2.19E+02	2.32E+00	2.21E+02	8.88E-02	-3.37E-02

APPENDIX C. NOISE AND VIBRATION ANALYSIS

C.1 Introduction & Project Description

The Massachusetts Executive Office of Transportation (EOT), in conjunction with the Pioneer Valley Planning Commission (PVPC), Vermont Agency of Transportation (Vtrans), Pan Am Southern Railroad (PAS), and Amtrak, is proposing to relocate the Amtrak intercity passenger train, known as the Vermonter, from the New England Central Railroad back to its former route on the Pan Am Southern Railroad between Springfield and East Northfield in Massachusetts. The Vermonter operates daily between St. Albans, Vermont and Washington, D.C. The routing of the Vermonter in Vermont and south of Springfield would remain unchanged.

It is anticipated that initial service would include station stops at the former Amtrak station at Northampton and the new intermodal station at Greenfield, with a potential for additional stations in the future.

The project would include improvements to the existing Pan Am Southern rail line, including crosstie replacement, rail replacement, rehabilitation of grade crossings, reactivation of passing sidings and portions of double track, upgrading of switches, improvements to signal and communications systems, surfacing and alignment of track, and improvements to bridges and station platforms.

The Project improvements would occur within the existing right-of-way owned by the Pan Am Southern. The Project does not involve any acquisition of additional right-of-way.
The Proposed Project does not involve any additional ballast or fill material to be placed beyond the existing limits of ballast or fill. As such, there would be no culvert repair or replacement.
There will be no in-water work in federal or state regulated wetlands or waterways.
The Project does not involve clearing or grading activity.

The proposed project has potential to change noise and vibration emissions from trains in the corridor. Therefore, noise and vibration analyses were performed using guidelines published by the Federal Railroad Administration (FRA) and Federal Transit Administration (FTA). The analyses evaluated noise and vibration from trains under existing and future conditions.

C.2 Regulatory Requirements

The proposed project is subject to environmental review requirements of the National Environmental Policy Act (NEPA).

C.3 Technical Approach

Federal Railroad Administration (FRA) and Federal Transit Administration (FTA) methodologies were used to assess noise and vibration associated with the proposed project. Spreadsheet models were used to estimate existing noise levels, determine noise impact thresholds, calculate wayside noise levels (the noise due to a train pass-by event), and to

calculate locomotive horn noise levels at public at-grade crossings. The FRA grade crossing database was used to identify potential public at-grade crossings in the project area. That database was refined based on project plans and information collected during the preparation of this environmental assessment. Geographic Information System (GIS) technology was used extensively to evaluate spatial relationships between the rail line and noise- and vibration-sensitive land uses in the project area, and also to evaluate population density – in an assessment of existing noise levels.

The proposed project will result in the relocation of a passenger train. Noise and vibration effects of the passenger train in the current corridor will be eliminated; this is a benefit of the proposed project. Noise and vibration analyses described in this technical memorandum do not quantify the net benefit of relocating the passenger service to a different project corridor, yet the benefit is recognized to occur.

C.4 Assessment of Noise

This section discusses the methodology and potential impacts related to the operational airborne noise from the proposed Knowledge Corridor Project. The noise analysis followed Federal Transit Administration (FTA) guidelines published in "Transit Noise and Vibration Impact Assessment" (May 2006). The project team performed a Noise Screening Assessment and a General Noise Assessment in accordance with FTA guidelines to assess project-related airborne noise.

Human Perception Levels

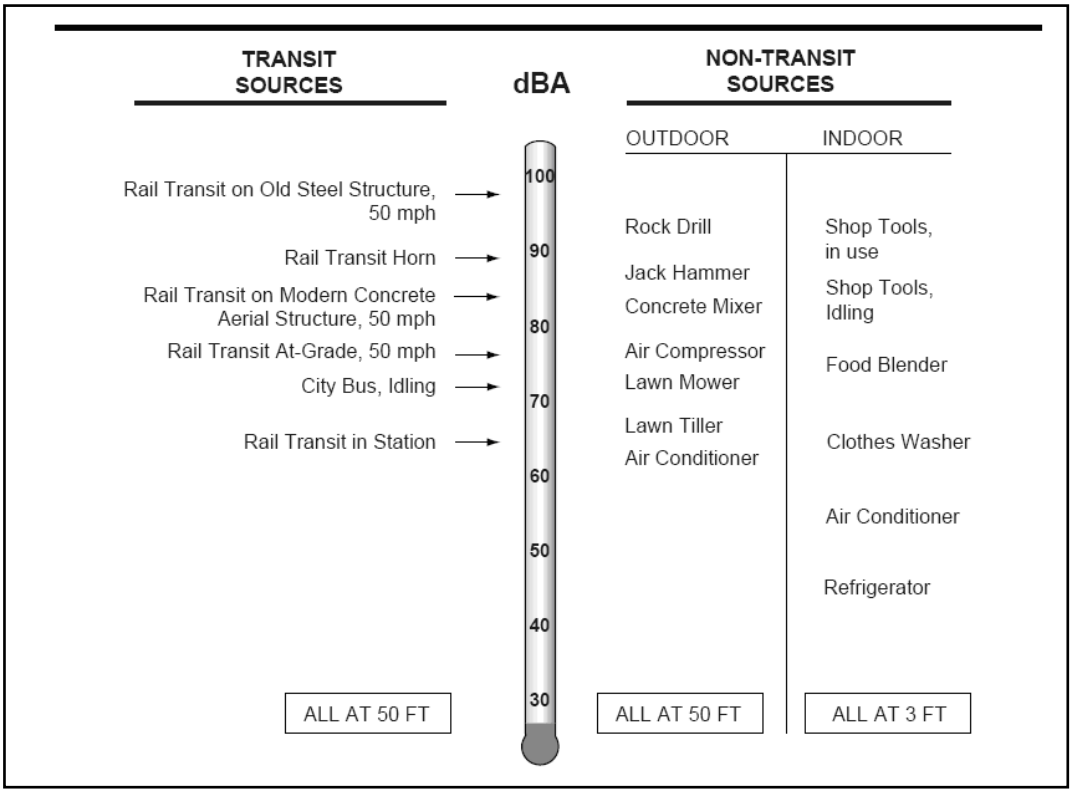
Sound travels through the air as waves of tiny air pressure fluctuations caused by vibration. In general, sound waves travel away from the noise source as an expanding spherical surface. As a result, the energy contained in a sound wave is spread over an increasing area as it travels away from the source, resulting in a decrease in loudness at greater distances from the noise source. Noise is typically defined as unwanted or undesirable sound.

The intensity or loudness of a sound is determined by how much the sound pressure fluctuates above and below the atmospheric pressure and is expressed in units of decibels. The decibel (dB) scale used to describe sound is a logarithmic scale that accounts for the large range of sound pressure levels in the environment. By using this scale, the range of normally encountered sound can be expressed by values between 0 and about 140 dB.

Sound-level meters measure the actual pressure fluctuations caused by sound waves and record separate measurements for different frequency ranges. Most sounds consist of a broad range of sound frequencies, from low frequencies to high frequencies. The average human ear does not perceive all frequencies equally. Therefore, the A-weighting scale was developed to approximate the way the human ear responds to sound levels; it mathematically applies less "weight" to frequencies we don't hear well, and applies more "weight" to frequencies we do hear well. Typical A-weighted noise levels for various types of sound sources are summarized in Figure 1 (Typical A-Weighted Sound Levels).

Figure 1 Typical A-Weighted Sound Levels

Source: FTA, "Transit Noise and Vibration Impact Assessment" (May 2006)



The equivalent sound level (Leq) is often used to describe sound levels that vary over time, usually a one-hour period. The Leq is considered an energy-based average noise level. Using twenty-four consecutive 1-hour Leq values it is possible to calculate daily cumulative noise exposure. The descriptor used to express daily cumulative noise exposure is the Day-Night Sound Level (Ldn). The Ldn includes a 10-dBA penalty imposed on noise that occurs during the nighttime hours (between 10 PM and 7 AM) where sleep interference might be an issue. The 10-dBA penalty makes the Ldn useful when assessing noise in communities. The Sound Exposure Level (SEL) combines the equivalent sound level with the duration of an event to determine the total amount of noise exposure.

The logarithmic nature of dB scales is such that individual dB levels for different noise sources cannot be added directly to give the noise level for the combined noise source. For example, two noise sources that produce equal dB levels at a given location will produce a combined noise level that is 3 dBA greater than either sound alone. When two noise sources differ by 10 dBA, the combined noise level will be 0.4 dBA greater than the louder source alone.

People generally perceive a 10-dBA increase in a noise level as a doubling of loudness. For example, a 70-dBA sound will be perceived by an average person as twice as loud as a 60-dBA sound. People generally cannot detect differences of 1 dBA to 2 dBA. Differences of 3 dBA can be detected by most people with average hearing abilities. A 5-dBA change would likely be perceived by most people under normal listening conditions.

When distance is the only factor considered, sound levels from isolated point sources of noise typically decrease by about 6 dBA for every doubling of distance from the noise source. When the noise source is a continuous line (for example, vehicle traffic on a highway), noise levels decrease by about 3 dBA for every doubling of distance away from the source.

Noise levels at different distances can also be affected by factors other than the distance from the noise source. Topographic features and structural barriers that absorb, reflect, or scatter sound waves can increase or decrease noise levels. Atmospheric conditions (wind speed and direction, humidity levels, and temperatures) can also affect the degree to which sound is attenuated over distance.

Reflections off topographical features or buildings can sometimes result in higher noise levels (lower sound attenuation rates) than would normally be expected. Temperature inversions and wind conditions can also diffract and focus a sound wave to a location at considerable distance from the noise source. As a result of these factors, the existing noise environment can be highly variable depending on local conditions.

Noise Evaluation Criteria

The FTA established procedures and guidelines for assessing noise impacts. The noise descriptors most often used for transit noise evaluations are the dBA, the Leq and the Ldn. The FTA impact criteria are used to estimate existing noise levels and future noise impacts from transit operations.

The land use classifications applicable to transit projects are shown in Table 1 (Land Use Categories and Metrics for Transit Noise Impact Criteria). The Ldn descriptor is used to assess transit-related noise at residential and land uses where overnight sleep occurs. The Leq descriptor is used to assess transit-related noise at other land uses.

The FTA noise impact criteria are defined by two curves, severe and moderate, which are defined below.

- **Severe Impact.** A significant percentage of people are highly annoyed by noise in this range. Noise mitigation would normally be specified for severe impact areas unless it is not feasible or reasonable (unless there is no practical method of mitigating the impact).
- **Moderate Impact.** In this range, other project-specific factors are considered to determine the magnitude of the impact and the need for mitigation. Other factors include the predicted increase over existing noise levels, the types and number of noise-sensitive land uses affected, existing outdoor-indoor sound insulation, and the cost-effectiveness of mitigating noise to more acceptable levels.

Table 1 Land-Use Categories and Metrics for Transit Noise Impact Criteria

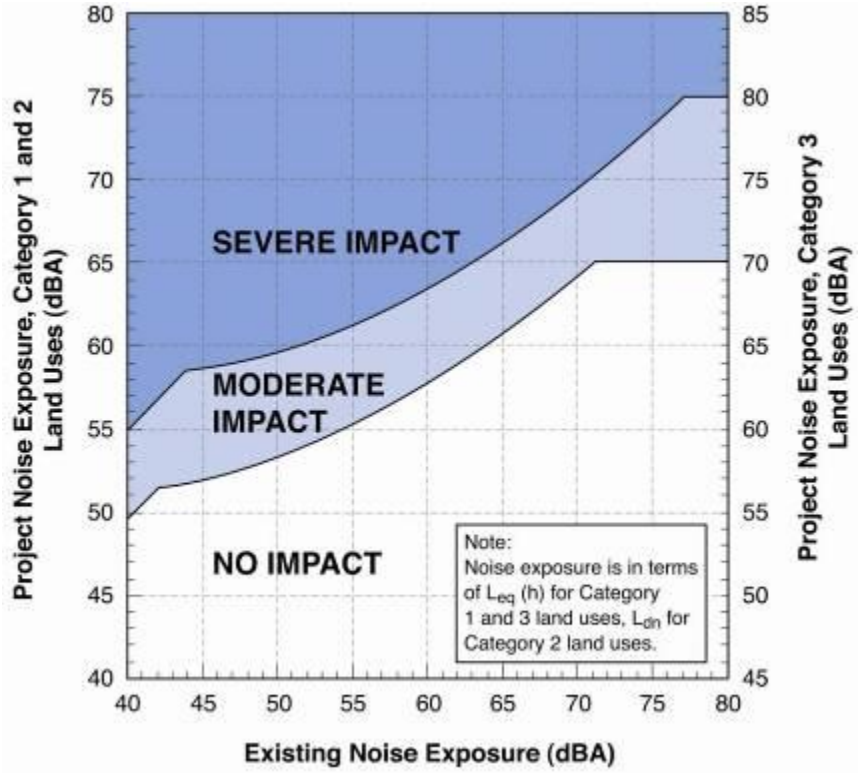
Land-Use Category	Noise Descriptor (dBA)	Description of Land-Use Category
1	Outdoor Leq(h)[a]	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as national historic landmarks with significant outdoor use. Also included are recording studios and concert halls.
2	Outdoor Ldn	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor Leq(h)[a]	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material. Places for meditation or study associated with cemeteries, monuments, museums, campgrounds and recreational facilities can also be considered to be in this category. Certain historical sites and parks are also included. .

Source: FTA, "Transit Noise and Vibration Impact Assessment" (May 2006)

[a] Leq for the noisiest hour of transit-related activity during hours of noise sensitivity.

The FTA noise impact criteria are shown in Figure 2 (FTA Noise Impact Criteria) below. The figure illustrates existing noise exposure and project-related noise exposure, and demonstrates that FTA noise impact thresholds vary with existing noise levels.

FIGURE 2 FTA NOISE IMPACT CRITERIA



Methodology

Airborne noise effects associated with the proposed Knowledge Corridor Project were evaluated using the FTA's Noise Screening Assessment and General Noise Assessment methods ("Transit Noise and Vibration Impact Assessment," May 2006). The project team identified noise-sensitive land uses using digital aerial photographs, land use-related GIS files and internet searches.

The Noise Screening Assessment looks for the presence of noise-sensitive land uses within FTA's fixed, default screening distances. Results of the screening assessment confirmed the presence of noise-sensitive land uses within the default screening distance. Therefore a General Noise Assessment was performed. This methodology included identifying noise-sensitive land uses in the project corridor, estimating existing outdoor noise levels in the project area, using the existing noise levels to identify noise impact thresholds, calculating project-related outdoor noise levels, and determining if project-related noise levels exceed FTA noise impact thresholds.

Existing outdoor noise levels were estimated in accordance with FTA guidelines presented in Chapter 5 of the guidance document (FTA, 2006). The existing noise exposure was calculated for each noise segment based on proximity to roads, rail lines and population density. The maximum representative noise level, calculated based on the receptors distance from roads, rail lines and population density was used as a representative existing noise level.

Sound exposure levels (SEL) for project related noise sources were estimated using FTA reference values. Reference SEL's used in the Knowledge Corridor noise analysis are shown in Table 2, and represent the estimated sound exposure level for a noise event measured at a distance of 50 feet from the track at a speed of 50 mph. The reference SEL for an idling

locomotive is also shown; this was used to assess noise from passenger trains idling in the stations.

Table 2 Sound Exposure Levels used in the General Noise Assessment

Noise Source	Sound Exposure Level (SEL_{ref})
Railcar Pass-by	82 dBA
Locomotive Pass-by	92 dBA
Idling Locomotive in a Station	109 dBA
Audible Warning Signal (horn)	110 dBA

The General Noise Assessment incorporated the following assumptions:

- Noise impact thresholds were based on the land-use category and the estimated existing noise level.
- The analysis assumed soft, absorptive ground, resulting in a ground factor G = 0.625 for ground attenuation, and ignored shielding effects.

Table 3 presents the rail traffic information used in this analysis.

Table 3. Rail Traffic Summary Information

		Current	Proposed
Freight Trains	Daytime trains (7AM – 10 PM)	7	9
	Nighttime trains (10PM – 7AM)	2	2
	No. of Locomotives	1 or 2	1 or 2
	No. of Cars	20-40	20-50
	Speed (mph)	10	40
Passenger Trains	Daytime trains (7AM – 10 PM)	0	2
	Nighttime trains (10PM – 7AM)	0	0
	No. of Locomotives	0	1
	No. of Cars	0	5
	Speed (mph)	0	60

Existing Noise Levels

Existing outdoor noise levels were estimated in accordance with FTA guidelines. The existing noise exposure was calculated for each noise-sensitive receptor based on proximity to roads, rail lines and population density. The maximum representative noise level, calculated based on the receptors distance from roads, rail lines and population density was used as a representative existing noise level.

For the purpose of the General Noise Assessment, the proposed Knowledge Corridor was separated into nine segments. The nine segments were selected to represent a range of existing noise conditions throughout the corridor. Six of the segments include the urban areas along the right-of-way. Two segments are areas where roadways are very near the rail right-of-way and their noise is assumed to dominate the ambient acoustic environment. The final segment consists of all the remaining areas, mostly rural, not included in the other segments.

Using the methods described above, the existing noise exposures for each of the nine segments are presented in Table 4. The existing noise exposure for each noise segment was calculated by averaging the calculated existing noise levels for all receivers within the area.

Table 4 Existing Noise Exposure in the Project Area

Segment Name	Dominant Existing Noise Source	Existing Noise Exposure (dBA)	
		Ldn	Leq Day
Greenfield	Rail	64	56
Deerfield	Rail	64	55
South Deerfield	Rail	64	55
Northampton	Rail	66	57
Holyoke	Rail	64	57
Springfield Area	Rail	66	58
Mt. Hermon Station Road	Roadway / Interstate	69	68
Northampton Road	Roadway / Interstate	65	63
Rural Areas	Rail	64	55

Noise Analysis Results

Table 5 presents the number of noise impacts per project segment. The table shows analysis results including severe and moderate noise impacts for each of the three land use categories used by FTA.

Table 5 Summary of Impacted Receptors

Project Segment		Airborne Noise Impacts	
		Severe	**Moderate**
Greenfield	Category 1	0	0
	Category 2	0	44
	Category 3	0	3
Deerfield	Category 1	0	0
	Category 2	0	4
	Category 3	0	2
South Deerfield	Category 1	0	0
	Category 2	0	14
	Category 3	0	0
Northampton	Category 1	0	0
	Category 2	0	30
	Category 3	0	1
Holyoke	Category 1	0	0
	Category 2	0	21
	Category 3	0	1
Springfield Area	Category 1	0	0
	Category 2	0	1
	Category 3	0	5
Northampton Road	Category 1	0	0
	Category 2	0	22
	Category 3	0	1
Mt. Hermon Station Road	Category 1	0	0
	Category 2	1	4
	Category 3	0	0
Rural	Category 1	0	0
	Category 2	1	49
	Category 3	0	1
Total		**2**	**203**

Analysis results project a total of 205 noise impacts due to the proposed project: 203 moderate noise impacts and 2 severe noise impacts. Both of the severe impacts result from horn noise where a Category 2 receptor lies very near the rail line. Creating new quiet zones at these two grade crossings could mitigate these predicted severe noise impacts; receiver-based treatments (i.e. new storm windows and storm doors with a high transmission loss, central air conditioning, etc.) could also be used to mitigate the severe noise impacts. Of the moderate impacts, 14 were impacts to Category 3 receptors and the remaining 189 were to Category 2 receptors. Based on the linear extent of the proposed project, and the number of urban areas it passes through, the number of moderate noise impacts is not unusal. There are no impacts to Category 1 receptors. Figure 3, at the end of this technical memorandum, shows the locations where noise impacts are predicted to occur.

C.5 Assessment of Vibration

This section summarizes the methodology and results of the vibration analysis. The Screening Vibration Assessment and General Vibration Assessment described here was prepared in accordance with FTA guidelines ("Transit Noise and Vibration Impact Assessment" (May 2006)) to estimate the number of potential ground-borne vibration impacts created by the proposed project.

Human Response and Perception of Vibration Levels

Ground-borne vibration can be a concern for residents or at facilities that are vibration-sensitive, such as laboratories or recording studios. The effects of ground-borne vibration include perceptible movement of building floors, interference with vibration sensitive instruments, rattling of windows, shaking of items on shelves or hanging on walls, and rumbling sounds.

Vibration consists of rapidly fluctuating motions. However, human response to vibration is a function of the average motion over a longer (but still short) time period, such as one second. The root mean square (RMS) amplitude of a motion over a one second period is commonly used to predict human response to vibration. For convenience, decibel notation is used to describe vibration relative to a reference level. This analysis uses the unit of vibration decibels (VdB) relative to a reference of 10^{-6} inches per second (1 μin/sec) per FTA and FRA.

In contrast to airborne noise, ground-borne vibration is not a phenomenon that most people experience every day. The background vibration level in residential areas is usually 50 VdB or lower—well below the threshold of perception for humans, which is around 65 VdB. Levels at which vibration interferes with sensitive instrumentation such as nuclear magnetic resonance (NMR) equipment and other optical instrumentation can be much lower than the threshold of human perception. Most perceptible indoor vibration is caused by sources within a building such as the operation of mechanical equipment, movement of people, or slamming of doors. Typical outdoor sources of perceptible ground-borne vibration are construction equipment, steel-wheeled trains, and traffic on rough roads.

Vibration as it relates to railway movements is generally caused by uneven interactions between the wheels of the train and the railway surfaces. Examples of this include wheels rolling over rail joints and flat spots on wheels that are not true. These uneven interactions result in vibration that travels through the adjacent ground. This vibration can range from barely perceptible to very

disruptive. The following section provides a description of how vibration affects human activity, which is generally classified by land use categories.

FTA Vibration Criteria

The FTA recognizes three land use categories for assessing general vibration impacts.

- **Land Use Category 1 – High Vibration Sensitivity:** This category includes buildings where low ambient vibration is essential for operations within the building that may be well below levels associated with human annoyance. Typical Category 1 land uses include vibration-sensitive research and manufacturing facilities, hospitals, and university research operations. Category 1 also includes special land uses, such as concert halls, television and recording studios, and theaters, which can be very sensitive to vibration and ground-borne noise. The FTA has developed special vibration levels for these land uses.
- **Land Use Category 2 – Residential:** This category includes all residential land uses and any building where people sleep, such as hotels and hospitals.
- **Land Use Category 3 – Institutional:** This category includes schools, churches, other institutions, and quiet offices that do not have vibration-sensitive equipment, but still have the potential for activity interference.

The criteria for ground-borne vibration (for a General Vibration Assessment) are shown in Table 6. The criteria for vibration and noise for Category 1 special buildings are shown in Table 7.

Table 6 Ground-Borne Vibration
Impact Criteria for General Vibration Assessment

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro inch/sec)		
	Frequent Events[1]	Occasional Events[2]	Infrequent Events[3]
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB[4]	65 VdB[4]	65 VdB[4]
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78 VdB	83 VdB

Source: FTA, "Transit Noise and Vibration Impact Assessment" (May 2006) (FTA-VA-90-1103-06), page 8-3.

Notes:

[1] "Frequent Events" is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.

[2] "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.

[3] "Infrequent Events" is defined as fewer than 30 vibration events per day. This category includes most commuter rail branch lines.

[4] This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration-sensitive manufacturing or research would require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

Table 7 Ground-Borne Vibration and Noise Impact Criteria for Special Buildings

Type of Building or Room	Ground-Borne Vibration Impact Levels (VdB re 1 micro-inch/sec)	
	Frequent Events[1]	Occasional or Infrequent Events[2]
Concert Halls	65 VdB	65 VdB
TV Studios	65 VdB	65 VdB
Recording Studios	65 VdB	65 VdB
Auditoriums	72 VdB	80 VdB
Theaters	72 VdB	80 VdB

Source: FTA, "Transit Noise and Vibration Impact Assessment" (May 2006) (FTA-VA-90-1103-06), page 8-4.

Notes:

[1] "Frequent Events" is defined as more than 70 vibration events per day. Most transit projects fall into this category.

[2] "Occasional or Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.

[3] If the building will rarely be occupied when the trains are operating, there is no need to consider impact. As an example, consider locating a commuter rail line next to a concert hall. If no commuter trains will operate after 7 p.m., the trains should rarely interfere with the use of the hall.

Methodology

A Screening Vibration Assessment was performed to determine if any vibration-sensitive land uses exist within FTA's fixed, default vibration screening distances. Results of the screening assessment confirmed the presence of vibration-sensitive land uses within FTA's screening

distances; therefore a General Vibration Assessment was performed. The General Vibration Assessment methods were used to evaluate vibration from existing freight, and future freight and passenger trains in the project corridor. Under existing conditions, freight trains travel at 10 mph on jointed track. The proposed project will result in freight trains traveling at 40 miles per hour (mph) and a passenger train moving at 60 mph, both on welded track.

The General Vibration Assessment began with a data gathering task in order to construct a geographic information system (GIS) for the project. The railway alignments, surface geology, land use databases, and aerial photography were among the critical information gathered. Vibration-sensitive receptors, as listed in the FTA guidance document, were identified using land use information, internet resources, and GIS technology.

Residences within the immediate vicinity of the rail line were identified in GIS. Hospitals, churches, schools, research facilities, TV studios, recording studios, concert halls, auditoriums, and theaters were identified during internet searches, and input into the GIS.

Once the critical datasets had been gathered the vibration effects of existing and project-related rail usage were analyzed. In order to determine the distance to vibration impact thresholds, the generalized (reference) ground surface vibration curve was adjusted to more accurately fit the expected conditions along the new alignment. The reference curve assumes a locomotive powered passenger or freight train traveling at 50 mph on welded track, over non-efficient soil. Given the actual conditions, and current and potential future track usage, adjustments for train speed, track type, and geology were applied. The reference vibration curve adjustment factors are provided in Table 8.

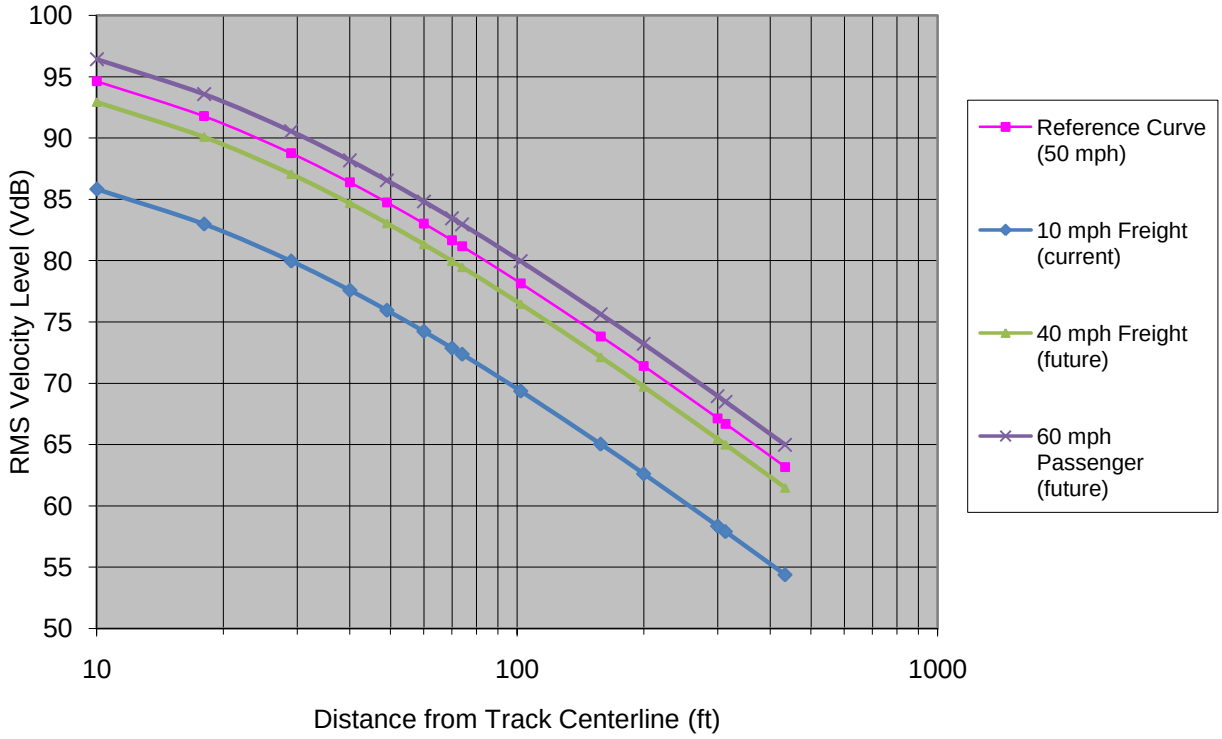
The surface geology of the area generally consists of a mixture of silt, sand, gravel, and floodplain sediments (all of which are assumed to be non-efficient at transmitting vibration for this assessment), and till, which is assumed to be a stiff clay and efficient at transmitting vibration. The footage of till that the new (west) alignment transects was calculated and a weighted average VdB adjustment applied to the entire alignment. Other reference vibration curve adjustments were made based on the rail usage scenario, and are summarized in Table 8.

Table 8 Reference Vibration Curve Adjustment Factors

Reference Curve Assumptions:		
Vehicle Type:	Locomotive Powered Passenger or Freight	
Speed (mph):	50	
Track:	Welded	
Geology:	Normal soil, not efficient	
Scenario #1 (Current Use): 10 mph Freight Train		
Reference Adjustment Factors:		
Speed:	**-14.0**	**dB, calc. per FTA guidance**
Track (jointed):	**5**	**dB**
Geology:	10	dB, for till
	0	dB, for sand/gravel/sediment
	0.2	**dB, weighted average**
Total Adjustments:	**-8.8**	**dB**
Scenario #2 (Future Use): 40 mph Freight Train		
Reference Adjustment Factors:		
Speed:	**-1.9**	**dB, calc. per FTA guidance**
Track (welded):	**0**	**dB**
Geology:	10	dB, for till
	0	dB, for sand/gravel/sediment
	0.2	**dB, weighted average**
Total Adjustments:	**-1.7**	**dB**
Scenario #3 (Future Use): 60 mph Passenger Train		
Reference Adjustment Factors:		
Speed:	**1.6**	**dB, calc. per FTA guidance**
Track (welded):	**0**	**dB**
Geology:	10	dB, for till
	0	dB, for sand/gravel/sediment
	0.2	**dB, weighted average**
Total Adjustments:	**1.8**	**dB**

The new ground surface vibration curves based on the adjustment factors in Table 8, as well as the reference curve, are show in Figure 4, below.

Figure 4
Ground Surface Vibration Curves



As Figure 4 shows, the 60 mph Passenger Train has the greatest potential vibration emission levels. Because of this, the vibration effects of the proposed project were assessed using vibration velocity levels generated by the 60 mph Passenger Train..

Using Figure 4, the distance to FTA ground-borne vibration impact levels were established for the various land use categories. Table 9 identifies the resulting distance to the vibration impact thresholds for each land use category. Based on the daily train counts for the current and anticipated rail there will be less than 30 vibration events (pass-bys) of the same type per day. Therefore the impact distances in Table 9 are based on Category 1, 2, and 3 land use vibration impact criteria for infrequent events.

Table 9 Distances to Vibration Impact Thresholds

Land Use Category	Impact Level (VdB)	Impact Distance (ft)	
		10 mph Freight Scenario (Current)	60 mph Passenger Scenario (Future)
Category 1	65	158	434
Category 2	80	29	102
Category 3	83	18	74
Special Buildings	65 or 80	158	434

Results

Table 10 summarizes the potential vibration impacts associated with the proposed project. Figure 5, at the end of this technical memo, contain figures showing the locations where ground-borne vibration impacts are predicted to occur.

Table 10
Potential Vibration Impacts

Land Use Category	Number of Vibration Impacts	
	10 mph Freight Scenario (Current)	60 mph Passenger Scenario (Future)
Category 1	0	0
Category 2	0	98
Category 3	0	2
Special Buildings	0 @ 65 VdB 0 @ 80 VdB	1 @ 65 VdB 0 @ 80 VdB

As Table 10 indicates, the existing 10 mph freight train on jointed track is predicted to result in no ground-borne vibration impacts. The 60 mph passenger train on welded track would potentially add ninety-eight (98) Category 2 impacts, two (2) Category 3 impacts and one (1) Special Building impact (a TV studio). Although Category 1 land uses were identified during this assessment, none fall within the distance to calculated vibration impact threshold.

Based on the limited number of train pass-by events under the Build Alternative, the potential vibration impacts at Category 2 and Category 3 land uses are considered acceptable under FTA guidance. The potential vibration impact at the television broadcast studio can be mitigated by installing track-based mitigation measures like resilient track fasteners or resilient ballast mats. Additionally, a Detailed Vibration Assessment could be performed prior to commencing corridor upgrades to identify the most appropriate track-based mitigation measure. The vibration effects associated with the Proposed Project are not considered significant.

C.6 References

Federal Transit Administration, Transit Noise and Vibration Impact Assessment, May, 2006.

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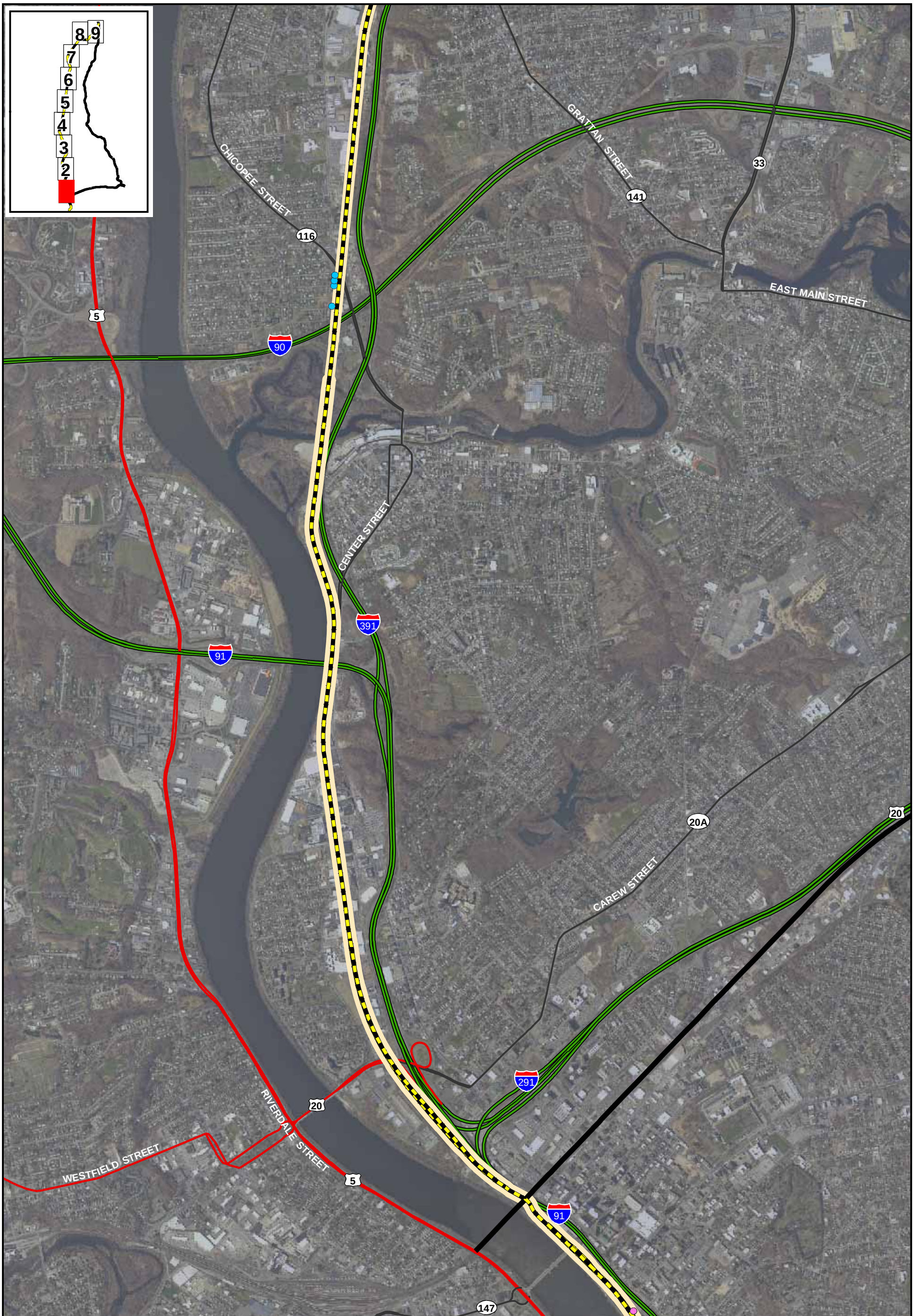

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Scale: 1 Inch = 2,000 Feet

0 1,000 2,000 Feet

Prepared By: HDR

Legend

- Category 3 Moderate Receptor
- Category 2 Severe Receptor
- Category 2 Moderate Receptor
- Wayside Noise Contour
- Proposed Vermonter Route
- Current Vermonter Route
- Interstate
- U.S. Highway
- State Route

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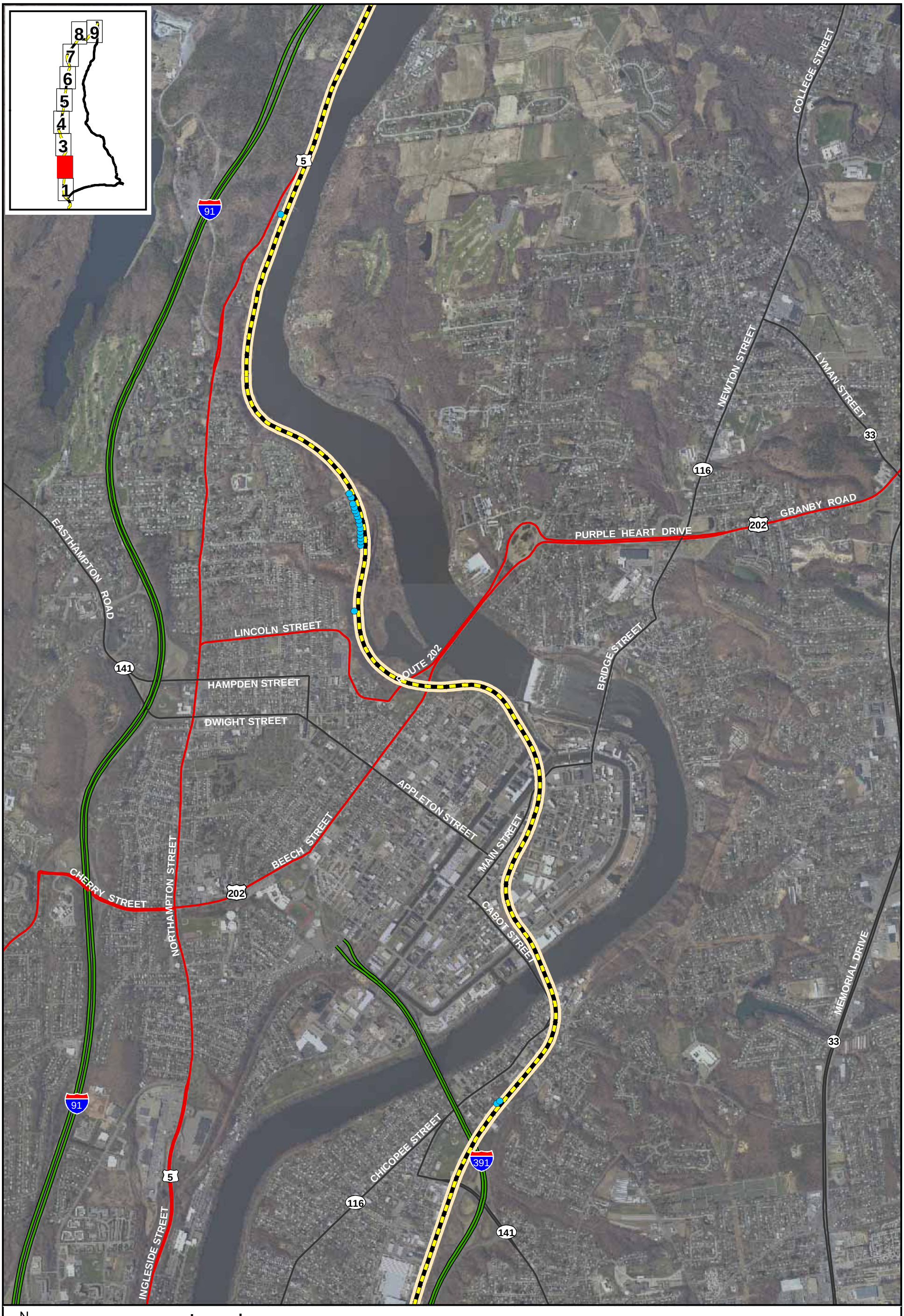
Knowledge Corridor - Restore Vermonter
Springfield to East Northfield, Massachusetts

Wayside Noise
Sheet 1 of 9



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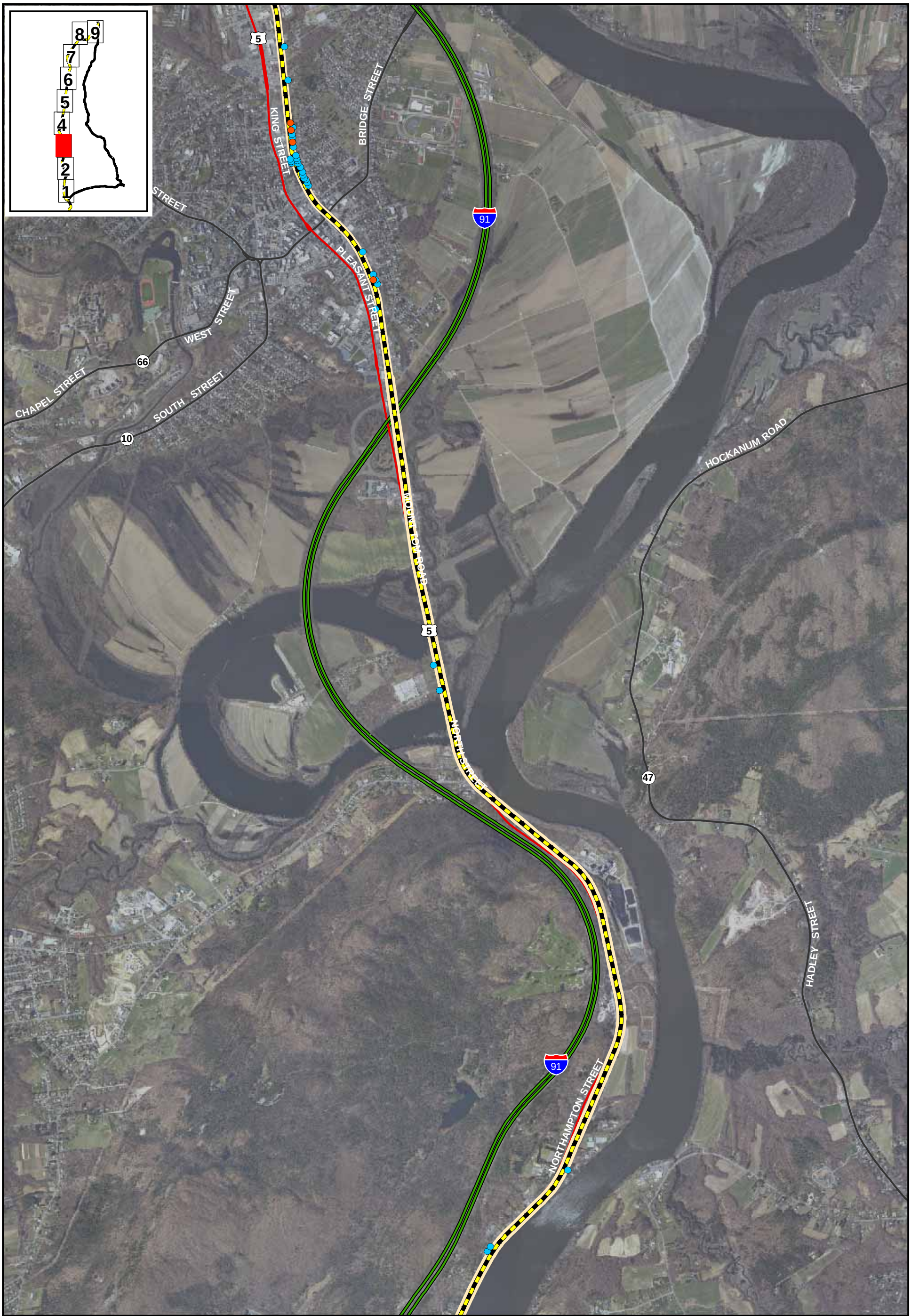

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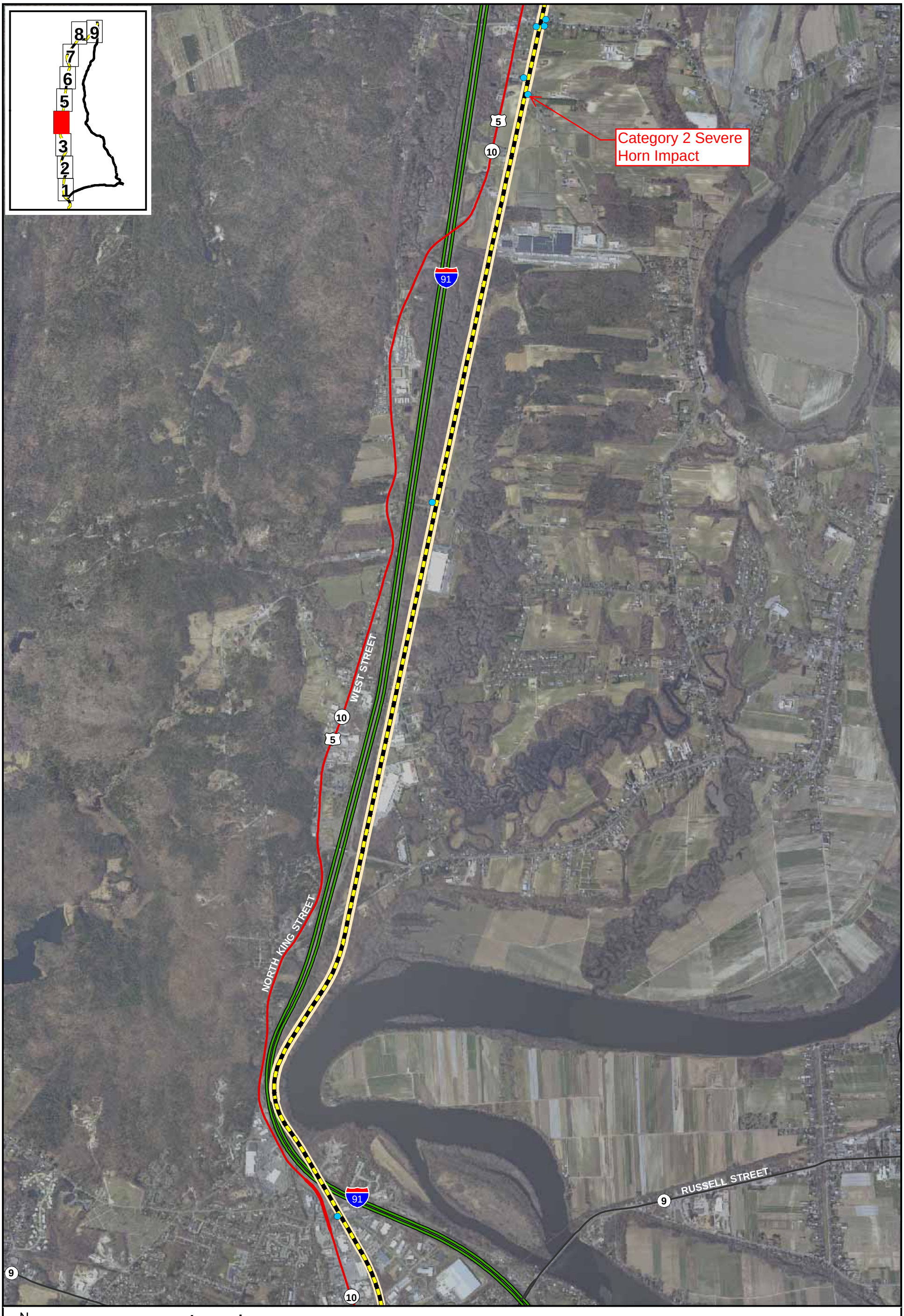

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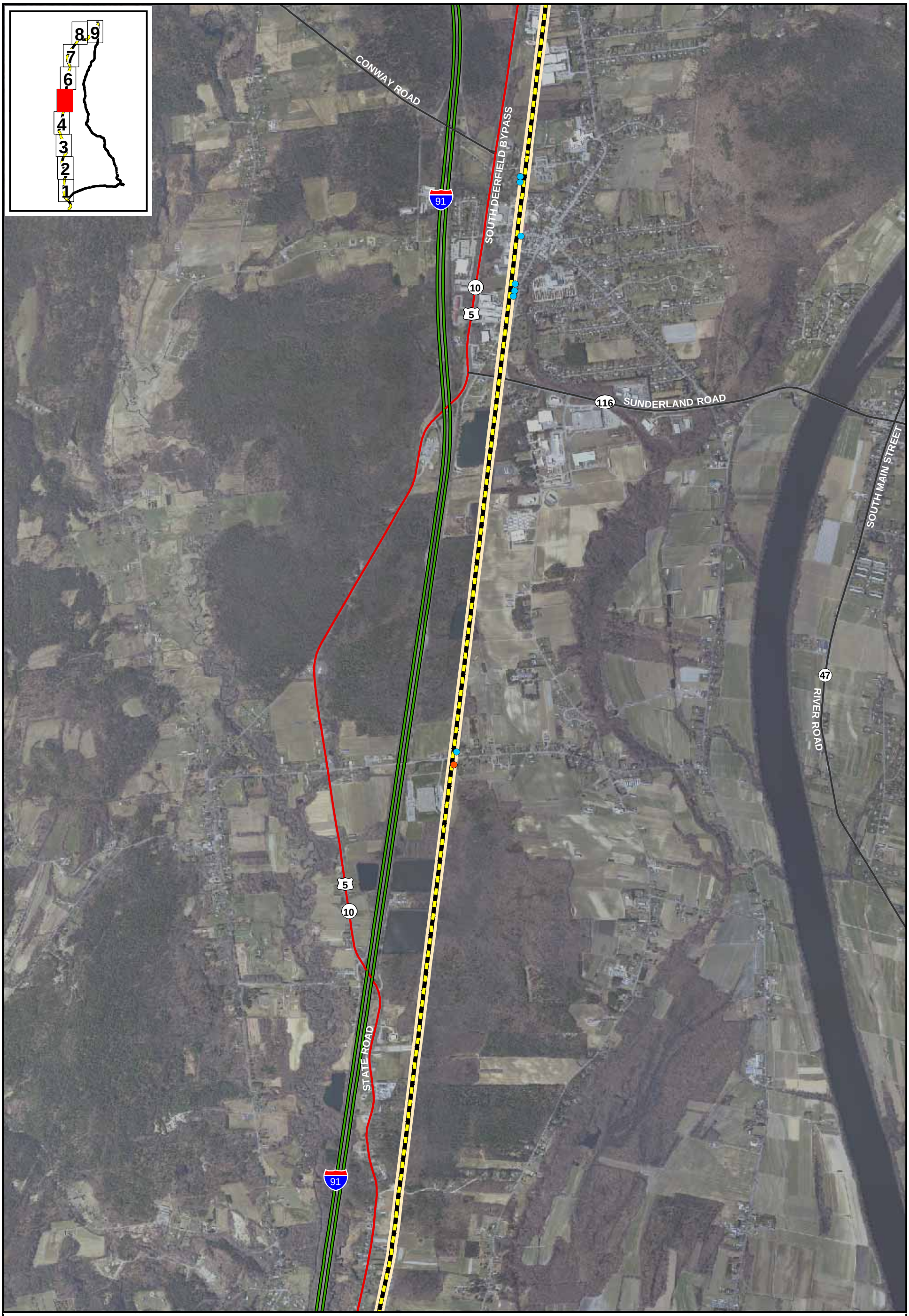

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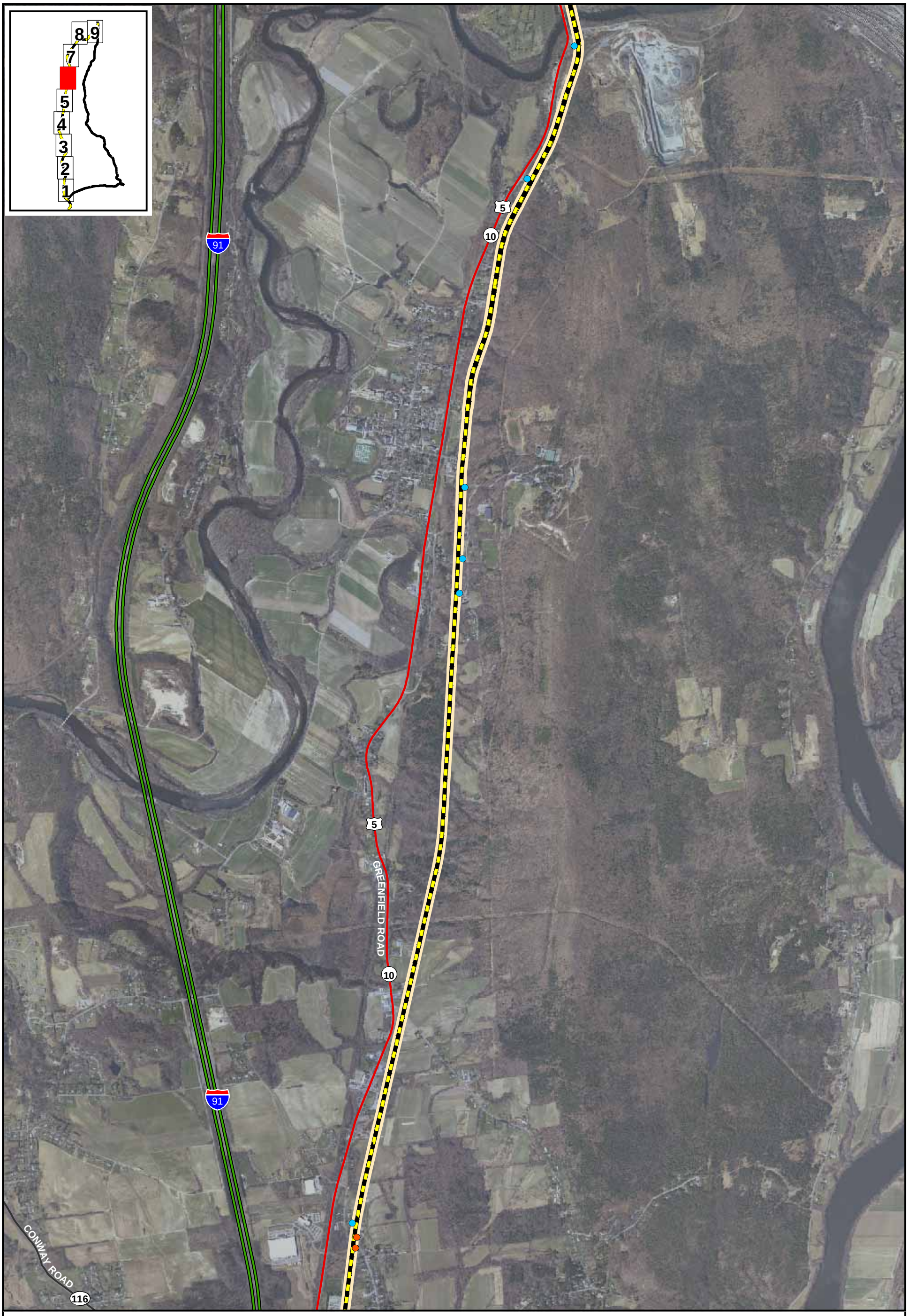

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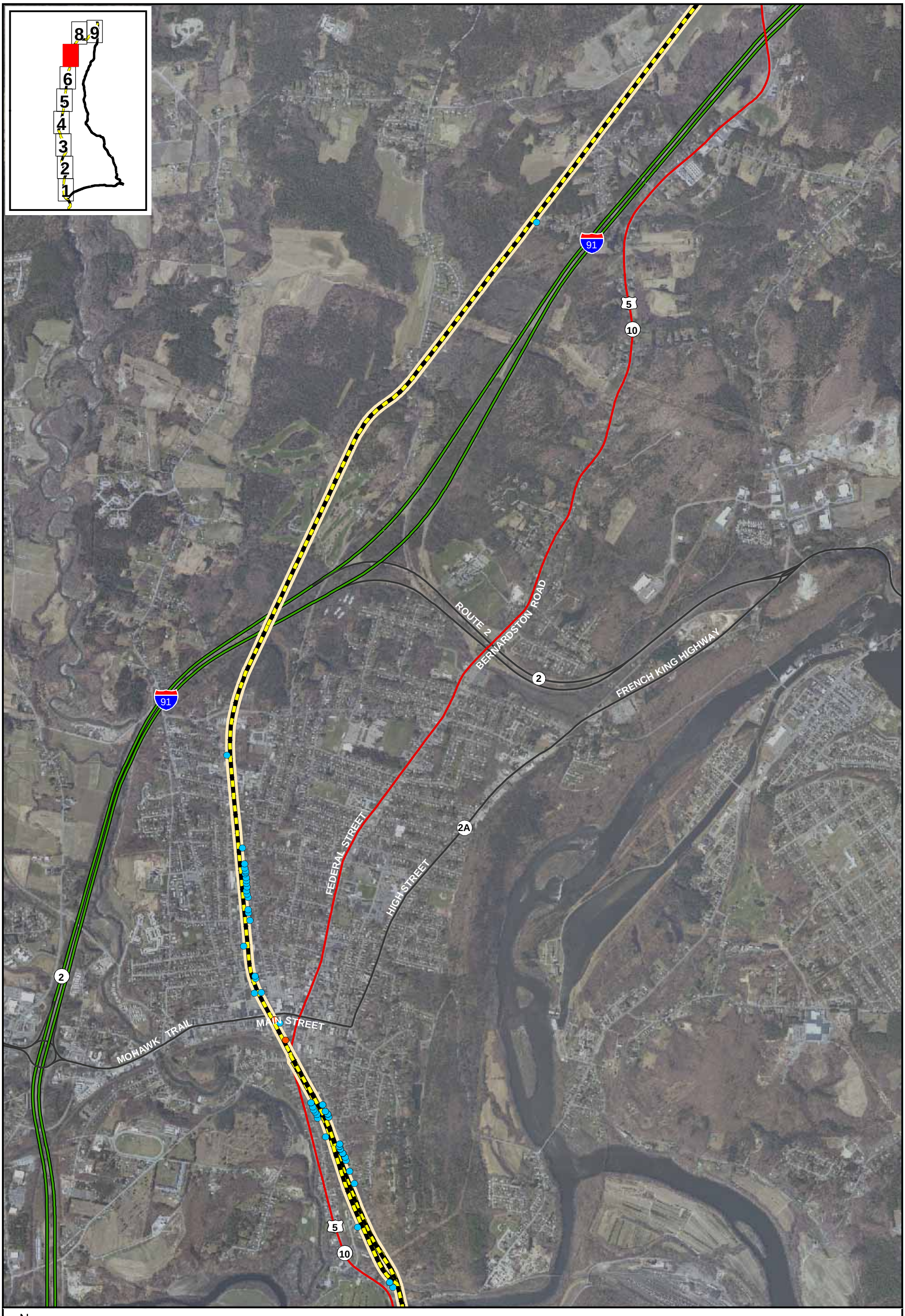

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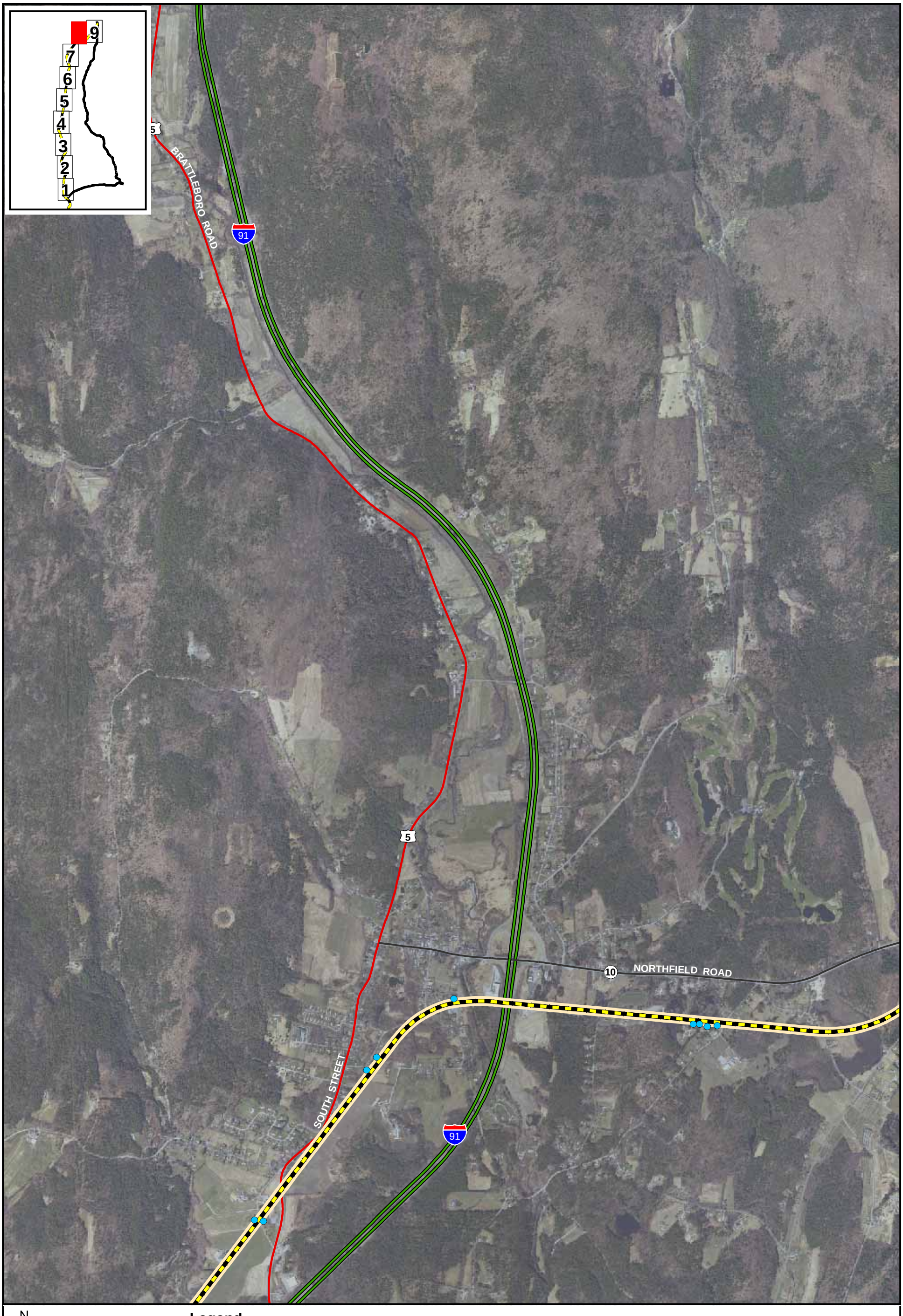

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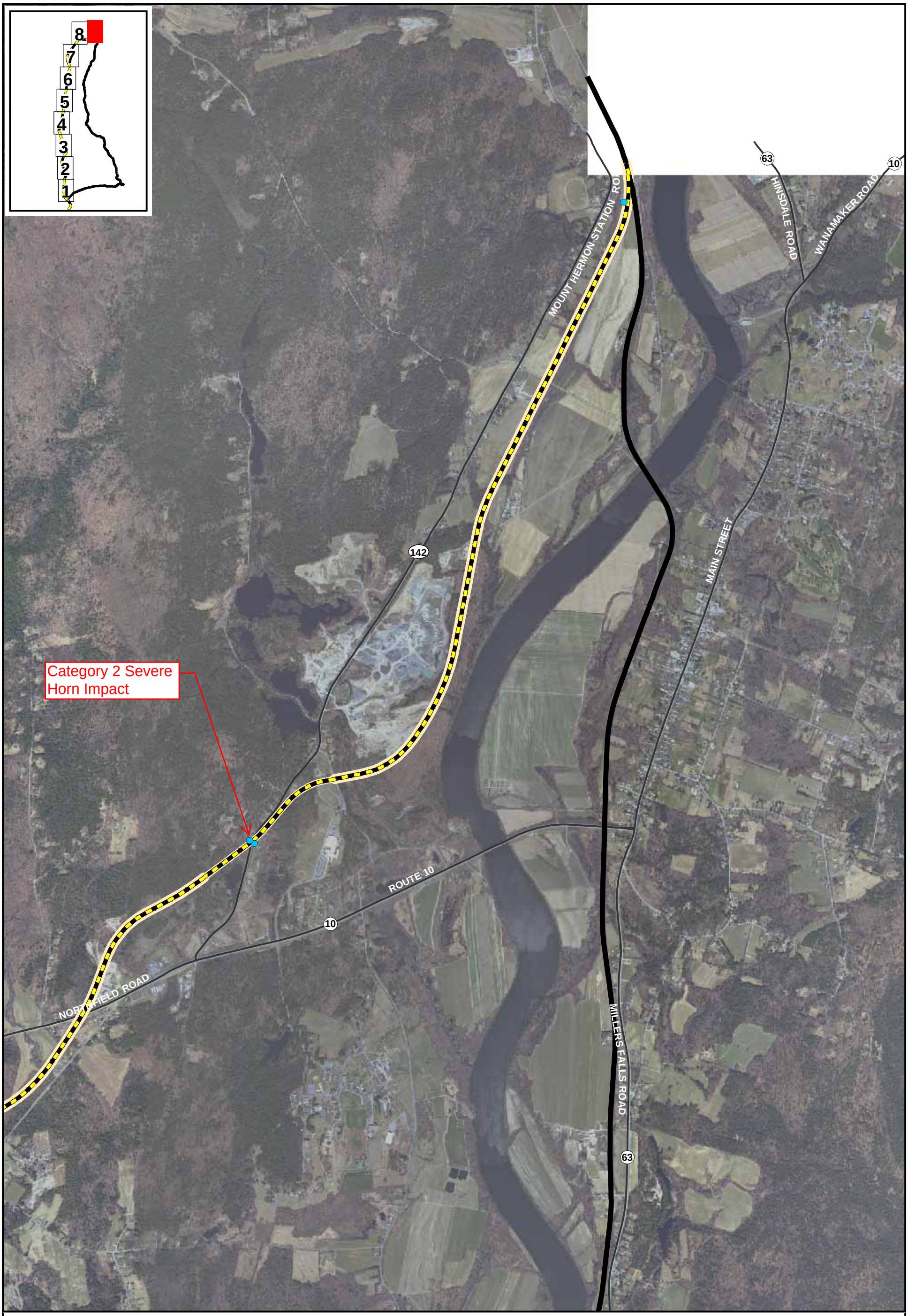
Wayside Noise
Sheet 8 of 9



N

Scale: 1 Inch = 2,000 Feet

0 1,000 2,000 Feet

Prepared By: HDR

Legend

- Category 3 Moderate Receptor
- Category 2 Severe Receptor
- Category 2 Moderate Receptor
- Wayside Noise Contour
- Proposed Vermonter Route
- Current Vermonter Route
- Interstate
- U.S. Highway
- State Route

Executive Office of Transportation

Knowledge Corridor - Restore Vermonter
Springfield to East Northfield, Massachusetts

Wayside Noise
Sheet 9 of 9

M E M O R A N D U M

Date: August 13, 2009

To: HDR, Inc.

From: Epsilon Associates, Inc.

Subject: Appendix D Threatened and Endangered Species

D1. Introduction and Project Description

The Massachusetts Executive Office of Transportation (EOT), in conjunction with the Pioneer Valley Planning Commission (PVPC), Vermont Agency of Transportation (Vtrans), Pan Am Southern Railroad (PAS), and Amtrak, is proposing to relocate the Amtrak intercity passenger train, known as the Vermonter, from the New England Central Railroad back to its former route on the Pan Am Southern Railroad between Springfield and East Northfield in Massachusetts. The Vermonter operates daily between St. Albans, Vermont and Washington, D.C. The routing of the Vermonter in Vermont and south of Springfield would remain unchanged.

It is anticipated that initial service would include station stops at the former Amtrak station at Northampton and the new intermodal station at Greenfield, with a potential for additional stations in the future.

The project would include improvements to the existing Pan Am Southern rail line, including crosstie replacement, rail replacement, rehabilitation of grade crossings, reactivation of passing sidings and portions of double track, upgrading of switches, improvements to signal and communications systems, surfacing and alignment of track, and improvements to bridges and station platforms.

The Project improvements would occur within the existing right-of-way owned by the Pan Am Southern. The Project does not involve any acquisition of additional right-of-way.

The Proposed Project does not involve any additional ballast or fill material to be placed beyond the existing limits of ballast or fill. As such, there would be no culvert repair or replacement. There will be no in-water work in federal or state regulated wetlands or waterways.

The Project does not involve clearing or grading activity.

The Project route passes by and over a range of habitats, including woodlands, rivers, waterbodies, and emergent and forested wetland systems, some of which are mapped habitat for state-listed species and a limited number of federally-listed species. Because Project activities will be located within maintained, previously disturbed areas, no new impacts to identified threatened or endangered species or their habitats are anticipated.

D.2 Regulatory Requirements

The following sections summarize the federal and state endangered species regulations that may be applicable to the Project.

D.2.1 US Endangered Species Act

The purpose of the U.S. Endangered Species Act (ESA) is to protect and recover imperiled species and the ecosystems upon which they depend. It is administered by both the Interior Department's U.S. Fish and Wildlife Service (USFWS) and the Commerce Department's National Marine Fisheries Service (NMFS). USFWS has primary responsibility for terrestrial and freshwater organisms, while the responsibilities of NMFS are mainly for marine wildlife such as whales and anadromous fish species.

Under the ESA, species may be listed as either endangered or threatened. "Endangered" means that a species is in danger of extinction throughout all or a significant portion of its range. "Threatened" means that a species is likely to become endangered within the foreseeable future.

The ESA protects endangered and threatened species and their habitats by prohibiting the "take"[1] of listed animals and the interstate or international trade in listed plants and animals, including their parts and products, except under federal permit.

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[1] Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct." Through regulations, the term "harm" is defined as "an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering." Listed plants are not protected from Take, although it is

Before initiating an action, under Section 7 of the ESA, the federal agency (i.e., Army Corps of Engineers) or its non-federal permit applicant coordinates with USFWS about listed species that may be within the action area. If a listed species is present, the federal agency must determine whether the project may affect it. If it may, consultation may be required. During consultation, the action agency receives a biological opinion or concurrence letter addressing the proposed action. If the action agency determines (and USFWS agrees) that the project is not likely to adversely affect a listed species or designated critical habitat, and USFWS concurs in writing, the consultation (informal to this point) is concluded.

Two federally-listed endangered species have been identified as occurring in towns along the existing right-of-way: the Dwarf Wedgemussel (*Alasmidonta heterodon*) and Shortnose Sturgeon (*Acipenser brevirostrum*). Both species are documented to occur in the Connecticut River. See Section D.3 below for further information on the federally-listed endangered species.

D.2.2 Massachusetts Endangered Species Act

The Massachusetts Endangered Species Act (MESA) is implemented by the Division of Fisheries and Wildlife - Natural Heritage and Endangered Species Program (NHESP). MESA protects rare species and their habitats by prohibiting the "take" of any plant or animal species listed as Endangered, Threatened, or of Special Concern by the Massachusetts Division of Fisheries and Wildlife. MESA protects habitat as well as individual plants and animals listed by the Division as endangered, threatened, or of special concern. A "take" is defined as, "in references to animals to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity or attempt to engage in any such conduct, or to assist such conduct, and in reference to plants, means to collect, pick, kill, transplant, cut or process or attempt to engage or to assist in any such conduct. Disruption of nesting, breeding, feeding or migratory activity may result from, but is not limited to, the modification, degradation or destruction of Habitat."

As part of MESA implementation, NHESP is responsible for reviewing projects and providing and maintaining maps that identify protected species habitat. These maps are available in a statewide paper atlas and GIS format. Shown on these maps are two types of protected species habitat: Priority Habitat for State Protected Species and Estimated

---

illegal to collect or maliciously harm them on federal land. Protection from commercial trade and the effects of federal actions does apply for plants. In addition, states may have their own laws restricting activity involving listed species, as Massachusetts does.

Habitats for Rare Wildlife. Priority Habitat includes habits for wetland and non-wetland wildlife and plant species. Estimated Habitat includes habitat for wetland dependent wildlife (animal) species only and is intended for use by both NHESP and local Conservation Commissions during the review of projects subject to the Wetlands Protection Act.

Upon review of available data (see Section D.3 below), the Project route crosses by and over mapped both Priority Habitat and Estimated Habitat. A number of state listed species have been documented in the eleven communities along the Project route.

D.3 Technical Approach

Mapped federally- and state-listed species habitats were reviewed through several sources including the Massachusetts Geographic Information System (MassGIS) database, the NHESP website www.mass.gov/dfwele/dfw/nhesp/nhesp.htm, and the U.S. Fish and Wildlife website www.fws.gov/endangered/wildlife.html.

Federally-listed Species

As discussed in Section B.2 above, two federally-listed endangered species -- the Dwarf Wedgemussel and the Shortnose Sturgeon -- have been identified as potentially occurring in the vicinity of the Project.

The Shortnose Sturgeon is one of the smallest species of sturgeon, rarely exceeding 1 meter (3 feet) in length. The Shortnose Sturgeon is an amphidromous species, meaning that it spawns in freshwater but enters saltwater habitats during its life. There are two documented populations of Shortnose Sturgeon in the Connecticut River.

The Dwarf Wedge Mussel is a small freshwater mussel, reaching a maximum length of 56.5 millimeters (2.2 inches). The Dwarf Wedgemussel inhabits well-oxygenated streams and rivers with sand, muddy sand, or gravel bottoms, with slow to moderate currents. The mussel was once found in the Connecticut River (along with other rivers throughout the state), however, it is uncertain if the species is still found in the state, as the last observed population was seen in 1983 and was extirpated by 1988.

As both identified federally endangered species are likely to exist solely within the Connecticut River, and no in-water work within the river is proposed, Project activities are not anticipated to adversely affect federally endangered species. Further consultation with the USFWS may be necessary if it is determined that a federal permit is required (e.g., Corps of Engineers Section 10 permit or U.S. Coast Guard Bridge Act permit) with

subsequent Section 7 consultation. At this time, however, consultation under the Endangered Species Act is not anticipated for the reasons noted above.

State Listed Species and Priority and Estimated Habitats

According to the NHESP database, a number of state-listed endangered, threatened and species of special concern potentially occur in the eleven communities along the Project route. (See www.mass.gov/dfwele/dfw/nhesp/nhesp.htm for a list of the species.) The exact locations of the species habitat is unknown at this time and further consultation with NHESP may be necessary to determine if Project activities are located within or adjacent to the listed species habitat; although, based on the nature of proposed activities, it is not expected that Project activities will result in a take and the need for a Conservation and Management Permit under MESA. As discussed above, the existing Project route is adjacent to mapped Priority Habitat and Estimated Habitat (see Attached Figure 1) and crosses mapped habitat in several municipalities, including Greenfield, Deerfield, Hatfield, Northampton, Easthampton, Holyoke, and Chicopee. The entire length and width of the Connecticut River is mapped Priority Habitat and Estimated Habitat.

D.4 Assessment of Endangered Species and Habitats

As no in-water work is proposed, impacts to federally-listed species are not anticipated.

As shown on Figure 1, the Project route crosses mapped Priority Habitat and Estimated Habitat in several communities. Project activities will be located within previously disturbed and cleared areas within the existing maintained right-of-way and no impacts to vegetated areas are proposed. Therefore, the proposed Project is not anticipated to result in a take and the need for a Conservation and Management Permit under MESA.

D.5 References

Commonwealth of Massachusetts, Executive Office of Energy and Environmental Affairs, Massachusetts Geographic Information System (http://www.mass.gov/mgis/).

Department of Fish and Game, Division of Fisheries and Wildlife -- Natural Heritage and Endangered Species Program website (www.mass.gov/dfwele/dfw/nhesp/nhesp.htm).

U.S. Fish and Wildlife website (www.fws.gov/endangered/wildlife.html).

See attached figure.

Heath
Colrain
Leyden
Bernardston
Northfield
Warwick
Royalston
Charlemont
Gill
Greenfield
Erving
Hawley
Shelburne
Orange
Buckland
Athol
Phillipston
Montague
Wendell
Ashfield
Deerfield
Conway
Leverett
Sunderland
Shutesbury
New Salem
Petersham
Goshen
Whately
Barre
Williamsburg
Chesterfield
Pelham
Amherst
Hadley
Northampton
Westhampton
New Braintree
Huntington
Easthampton
Belchertown
Ware
Granby
West Brookfield
South Hadley
Southampton
Holyoke
Montgomery
Warren
Ludlow
Palmer
Chicopee
Russell
Westfield
West Springfield
Springfield
Wilbraham
Brimfield
Monson
Agawam
Southwick
East Longmeadow
Hampden
Wales
Holland
Longmeadow

N

Scale: 1 Inch = 4 Miles

0 2 4 Miles

Prepared By: Epsilon Associates Inc.

Legend

- Proposed Vermonter Route
- Current Vermonter Route
- NHESP 2008 Massachusetts Certified Vernal Pools
- NHESP 2008 Priority Habitats for State-Protected Rare Species
- NHESP 2008 Estimated Habitats for Rare Wildlife: For Use with the MA Wetlands Protection Act Regulations (310 CMR 10)

EOT Executive Office of Transportation

Knowledge Corridor - Restore Vermonter
Springfield to East Northfield, Massachusetts

Rare Species Mapping

G:\Projects2\MA\Springfield\2727\EA\nhesp.mxd

Appendix E
Social & Economic Memorandum

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Pioneer Valley Planning Commission

Economic Development Analysis of Passenger Rail in the Knowledge Corridor

DRAFT

July 30, 2009

HDR Corporation
Decision Economics

Risk Analysis · Investment and Finance
Economics and Policy

Pioneer Valley Planning Commission

Economic Development Analysis of Passenger Rail in the Knowledge Corridor

July 30, 2009

Technical Memorandum

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1 INTRODUCTION

The realignment of rail service along the I-91 Knowledge Corridor in the Pioneer Valley of Massachusetts has the potential to provide economic development impacts for the cities along the corridor that will have station stops as well as the broader region. In order to assess the economic development potential related to rail improvements, a thorough examination of the conditions in the region, as well as the potential for development based on available land and other resources was considered. This document provides a detailed explanation of the process and methodology undertaken to estimate economic development impacts in terms of employment and population within the region. The results of the economic development analysis are for two forecast years and two service level scenarios.

This economic development analysis covers each of the four station cities in Massachusetts – Greenfield, Northampton, Holyoke, and Springfield – as well as the remaining areas of the counties in the region – Franklin, Hampden, and Hampshire. The analysis was conducted in terms of impacts on employment and population looking ahead to 2015 and 2030. The impacts presented are in terms of additional population or employment that would not be expected without the presence of the rail service. Data was obtained from local/regional economic development professionals and publicly available sources, and the model assumptions, framework and results were reviewed with the Technical Advisory Committee (TAC) and refined based on their feedback.

The remainder of this document is divided into the following sections:

- Overview of Economic Development Analysis
- Stakeholder Interview Findings
- Methodology, Model Development, and Assumptions
- Results

2 OVERVIEW OF ECONOMIC DEVELOPMENT ANALYSIS

This section of the technical memorandum covers an overview of the economic development analysis in terms of key objectives for the study and the process and logic of the economic modeling.

2.1 Objective and Purpose

There are two main objectives of the analysis:

- Estimate economic development induced by rail service improvement for input into ridership estimates.
- Identify opportunities for economic development throughout the region related to the rail realignment and service enhancement projects.

This technical memorandum presents economic development results of realigning and enhancing Knowledge Corridor passenger rail in the Pioneer Valley. The estimates represent incremental economic development impacts due to passenger rail, focused on Hampden, Hampshire and Franklin counties and the four proposed station areas for expanded rail service in the Pioneer Valley (Springfield, Holyoke, Northampton, and Greenfield). Incremental in this analysis means additional economic and demographic growth beyond baseline growth forecasts for the region. The results of this analysis are used to supplement baseline estimates of ridership for the passenger rail scenarios (i.e., additional residential and business development leading to higher levels of ridership).

2.2 Relevant Data, Reports, and Information

The following methodology was applied to estimate the economic development potential in the region:

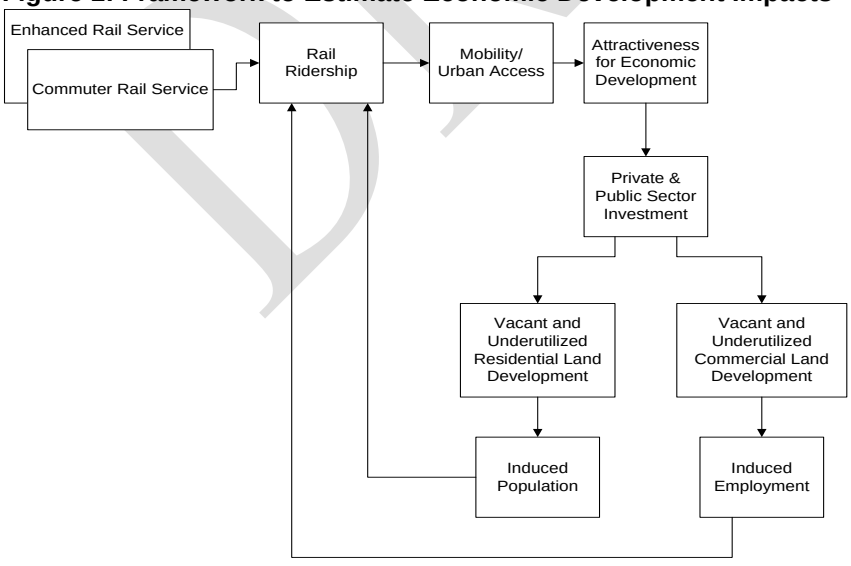
1) **Stakeholder interviews** – HDR conducted interviews with 12 economic development organizations in the Pioneer Valley to assess the "real world" context for development opportunities and to gather relevant data on development initiatives, land use, and real estate data.
2) **Data collection and review of other studies** – HDR gathered detailed data on historical and projected employment and population trends, and reviewed other passenger rail and economic development studies including a recently completed analysis of the Downeaster rail service from Portland to Boston.
3) **Model development** – Based on the data collected, the information from stakeholder interviews and reviews of other studies, HDR developed a modeling methodology. The model is a risk-based analysis which explicitly accounts for uncertainty in a number of key variables and produces a range of estimates.
4) **Results and risk analysis –** HDR generated an initial set of economic growth assumptions and risk factors that were presented to the TAC for review and scrutiny, leading to a refined set of economic development results.

The economic development estimates are presented in terms of:

- **Level of rail service** – "Enhanced" rail service that would be similar in nature to the current Portland-Boston Downeaster service (i.e., 5-6 trains a day in each direction), as well as "Commuter" rail service that would provide more frequent service for the morning and evening commutes with particularly strong connections to Connecticut.[1]
- **Geography** – Estimates of economic development gains are presented for the four cities mentioned above (with emphasis on development within 1 mile of the station locations) as well as the "rest of county" regions that reflect additional residential demand outside the four cities due to passenger rail.
- **Timing** – Reaching total economic development gains from rail or transit corridors typically takes multiple years and thus estimates are provided for 2015 and 2030 to account for the time required to implement rail service and the lag effect of development.
- **Jobs and Population** – The analysis captures residential and commercial /industrial development potential. The employment and population metrics developed are then used as inputs to generate the comprehensive ridership estimates.

The information and data gathered from this process are used to generate a model based on the logic that providing rail service will lead to increased access to the station cities and mobility, which will in turn make the areas more appealing for public, private, and non-profit investments, leading to development of currently vacant and underutilized properties. This development will lead to increased population and employment which, in turn, is expected to generate additional rail ridership potential. This process can be seen below in Figure 1.

Figure 1: Framework to Estimate Economic Development Impacts



[1] Less frequent passenger rail service in the Pioneer Valley could also result in induced economic development but likely at significantly lower levels and thus was not estimated separately.

3 STAKEHOLDER INTERVIEW FINDINGS

As part of the information gathering process, interviews were conducted with twelve economic development organizations[2] in the Pioneer Valley to assess development opportunities from a "real world" perspective, and gather relevant data on development initiatives, land use, and real estate. In order to gather the most pertinent information, the questions focused on two main categories: 1) economic development potential; and 2) commuting patterns/transit-oriented development (TOD). More specifically, economic development questions covered recent development trends, strengths of the region, and obstacles or constraints to growth. The TOD and commuting questions served to establish the likely impacts of commuter service, the capacity for transit-oriented development in terms of available land, and development initiatives necessary to support the rail service once implemented.

Feedback was gathered for each of the potential station cities (Greenfield, Northampton, Holyoke, and Springfield) and the region as a whole. In general, the mix of industries in the Pioneer Valley – with concentrations in healthcare, higher education, information technology, manufacturing, financial services and the creative economy – provides a relatively stable economy with less volatile peaks and valleys through the business cycle. In addition to the stable economy, the relatively low cost of living and large presence of higher education add to the draw of the region. Overall, the region has suitable physical infrastructure for further development but has lacked a true catalyst to accelerate growth. In particular, each of the four station cities already has a downtown infrastructure suitable to TOD including dense development patterns, historically active downtown centers, and nearby mixed use development.

While there is potential for induced development, there are also limitations including startup funding available in the region, a relatively stagnant underlying growth rate of development and private sector investment, and construction costs in excess of market rates for real estate. Construction costs in excess of market rates pose problems as it becomes exceedingly difficult to attract private investment and construct new buildings when the return on investment is not sufficient. While the broader regional concerns are important to understanding the impact of rail service, it was critical to gather information on each of the potential station cities. These findings are presented in the sections below.

3.1 Greenfield

Greenfield is the first proposed station city in Massachusetts when traveling southbound by rail from Vermont. Greenfield's strengths include an educated labor force due to the presence of numerous colleges within the region, low housing prices, and a high quality of life. The affordability of the region makes the downtown area an attractive place to live, and if rail is brought to the area the infrastructure to support TOD is present. The new Regional Transit Center, currently in the design process, will be located near the rail line and will become Franklin County's major bus hub providing synergy with the

[2] See Appendix A for a list of organizations and interviewees.

proposed rail service. Operations at the Regional Transit Center should create 180-200 new jobs in the immediately surrounding area once completed.

Greenfield has experienced relatively slow growth and development in the past which is not surprising given the region's initiatives toward preserving open space and agriculture uses. However, these efforts tend to be at odds with economic development and attracting major companies to Greenfield. Many of the larger companies (e.g., manufacturing) that were in the area have left Greenfield, but the remaining smaller companies are still thriving. The loss and lack of large employers, lack of high paying jobs, and limited access to public funding are constraining growth in the area.

Impacts from enhanced or commuter rail service in Greenfield are likely to be concentrated on: a) more residential development opportunities as Greenfield becomes a more attractive place to live given rail connections to the south; and b) a modest boost to downtown development opportunities in a mix of retail, restaurant and other businesses.

3.2 Northampton

The high level of environmental consciousness in Northampton makes it a strong candidate city for a rail station. The Sustainable Northampton Master Plan already calls for Transit Oriented Development, and given the potential office and commercial development opportunities in the downtown area, rail could have a positive impact on these initiatives. Northampton has a stable population and strong economy including a large retail and service sector with the presence of higher-end jobs. New developments are already taking place in the downtown area, including a new Urban Outfitters store and a 100-room Hilton hotel. Additionally, since the arts and creative economy has a very large presence in Northampton, a strong rail connection south to New York City has great potential. Northampton is also home to numerous cultural events as well as a vibrant nightlife which attracts a variety of visitors that might take advantage of rail connections for increased visitation. Possible barriers to development related to rail include the relatively high cost of land compared to other areas in the region, a relataive lack of developable land in close proximity to the station, and the lingering need for some infrastructure and broadband improvements.

3.3 Holyoke

Holyoke's economy has long suffered from the loss of key companies, the abandonment of several mill buildings, and slow moving efforts to re-build and re-develop. Like Springfield, it has been identified as a "gateway city" by the state of Massachusetts reflecting relative low per capita income, slow and declining growth, higher unemployment rates, and lower educational achievement. There are, however, some promising revitalization efforts taking place, including the development of an urban renewal plan for Holyoke focusing on development in the downtown area. More specifically:

- The downtown Canalwalk project is expected to help revitalize areas along the canal and has broken ground on construction.

- The Open Square space serves as artist loft, live/work space, and potential condos. It represents a successful private developer initiative in downtown Holyoke to attract a mix of uses and residents.
- The long-planned multimodal transportation center in the downtown area is moving forward and should be completed in May 2010. It is in relative proximity to the proposed rail station. This transportation center will bring Peter Pan bus service back to the city for the first time in 20 years and will also include a child care facility to aid working mothers, and Holyoke Community College (HCC) is planning to hold classes and offer job training for the first time in a downtown location.
- The recently announced Green High Performance Computer Center and Advanced Computing Initiative is a cooperative agreement between MIT, the University of Massachusetts, Cisco, EMC and other interested institutions to locate a world-class computing center in downtown Holyoke. The estimated $100 million facility is expected to create upwards of hundreds of jobs directly at the Center as well as businesses located nearby.

While these development plans advance in the downtown area, passenger rail could be a crucial component of fully achieving the revitalization potential of the City. In particular, a passenger rail station in downtown Holyoke could be a major asset in the City's efforts to direct future development back into the downtown area rather than continuing recent trends of commercial development near the Holyoke Mall and away from downtown. Holyoke's other strengths include low electric rates as the city produces its own power resulting in the lowest commercial and industrial rates in the state – a major draw for the Computing Center initiative. In addition, the City has Chapter 43D sites, Tax Increment Financing (TIFs) options, a foreign trade zone, and Industrial Park Zoning that should attract businesses to the area.

Constraints to potential growth include relatively high business tax rates, an education system with a poor perception and relatively weak test score performance, and lingering negative perceptions of the area. In addition, some recent projects now underway (Canal and multimodal center) have been in the planning and development phase for a long-time which (even if no-fault of the City) has created a perception that it takes a long time to achieve progress. Both a challenge and an opportunity, the abandoned mill buildings would need to be converted since manufacturing companies typically do not want to locate on the second and third floors of buildings. Taking these factors into account, Holyoke presents both a relatively large potential opportunity given current initiatives, with a history of slow revitalization and lagging economic performance that it is striving to overcome.

3.4 Springfield

Springfield is the final station city in Massachusetts, and would provide the connection south to Hartford, New Haven, and New York City. Springfield is the largest city in western Massachusetts and has both positive and negative attributes for potential development. While there is currently rail service in Springfield, greatly enhanced service

to new locations north of the city could benefit Springfield. The strengths of Springfield include a fairly stable economy due to the mix of industries present in the city, and low cost relative to other areas of the Commonwealth. Other potential strengths include a possible expansion of UMass-Amherst academic/research facilities into downtown Springfield as well as the planned commuter rail connection to Hartford and New Haven.

Main constraints to development include a lack of truly class A office space downtown, and lingering concerns about the city's fiscal stability, public safety and the education system. The level of activity downtown in terms of office workers and residents continues to be a challenge as anecdotal evidence suggests that some tenants are moving out of downtown for other locations within the region. One essential piece to contribute to growth is the re-use of the existing space as well as parking improvements. Since the area has construction costs that are generally above market lease or sales rates, private investment to build new or restored buildings has been lacking in recent years.

The redevelopment plan for the Union Station rail facility improves the practicality and feasibility of enhanced rail while potentially providing a catalyst to development in the surrounding area. Further development in the area related to the Station renovation is possible, but likely not financially feasible without public subsidies for the conversion of former office buildings to residential uses near the station. While the pieces seem to be falling into place for Springfield the catalyst to push development forward is still missing.

4 METHODOLOGY, MODEL DEVELOPMENT, AND ASSUMPTIONS

The applied methodology to estimate induced economic development due to improved rail scenarios in the Pioneer Valley used a risk analysis framework (Section 4.1), a set of key development assumptions and data (Section 4.2), and residential, commercial and office growth assumptions (Section 4.3).

4.1 Risk Analysis Framework

Forecasts traditionally take the form of a single "expected outcome" supplemented with alternative scenarios. The limitation of a forecast with a single expected outcome is clear -- while it may provide the single best statistical estimate, it offers no information about the range of other possible outcomes and their associated probabilities. The problem becomes acute when uncertainty surrounding the forecast's underlying assumptions is material.

A common approach to bracket the central estimate is to create a "high case" and "low case" scenario. This scenario approach can exacerbate the problem of dealing with risk because it gives no indication of likelihood associated with the alternative outcomes. The commonly reported "high case" may assume that most underlying assumptions deviate in the same direction from their expected value, and likewise for the "low case." In reality, the likelihood that all underlying factors shift in the same direction simultaneously is just as remote as everything turning out as expected.

Another common approach to providing added perspective on reality is "sensitivity analysis." Key forecast assumptions are varied one at a time in order to assess their relative impact on the expected outcome. The problem here is that the assumptions are often varied by arbitrary amounts. A more serious concern with this approach is that, in the real world, assumptions do not veer from actual outcomes one at a time. It is the impact of simultaneous differences between assumptions and actual outcomes that is needed to provide a realistic perspective on the riskiness of a forecast.

Risk Analysis avoids the problems outlined above and the remainder of this section explains the risk analysis process (RAP) applied in this study. It helps avoid the lack of perspective in "high" and "low" cases by measuring the probability or "odds" that an outcome will actually materialize. This is accomplished by attaching ranges (probability distributions) to the forecasts of each input variable. The approach allows all inputs to be varied simultaneously within their distributions, thus avoiding the problems inherent in conventional sensitivity analysis. The approach also recognizes interrelationships between variables and their associated probability distributions.

Assign Central Estimates and Conduct Probability Analysis

Each key factor or variable is assigned a central estimate and a range (a probability distribution) to represent the degree of uncertainty. Special data sheets are used (see

below) to record input from panelists. The first column gives an initial median (most likely) estimate while the second and third columns define an uncertainty range representing a 90 percent confidence interval. This is the range within which there exists a 90 percent probability of finding the actual outcome. The greater the uncertainty associated with a forecast variable the wider the range.

Example Data Sheet for Gas Prices (in 2009 dollars)

Year	Most Likely	Low Estimate	High Estimate
Years	$2.50	$1.75	$5.00

Probability ranges are established on the basis of both statistical analysis and subjective probability. Probability ranges need not be normal or symmetrical -- that is, there is no need to assume the bell shaped normal probability curve. The bell curve assumes an equal likelihood of being too low and being too high in forecasting a particular value. It might well be, for example, that if a projected growth rate deviates from expectations; circumstances are such that it is more likely to be higher than the median expected outcome.

The RAP model transforms the ranges as depicted above into formal probability distributions (or "probability density functions"). This liberates the non-statistician from the need to appreciate the abstract statistical depiction of probability and thus enables stakeholders to understand and participate in the process whether or not they possess statistical training.

Conduct Expert Evaluation: The RAP Session

The next step of the RAP involves the formation of an informed panel and the use of facilitation techniques to elicit risk and probability beliefs about:

a) The structure of the forecasting framework; and

b) Uncertainty attaching to each variable and forecasting coefficient within the framework.

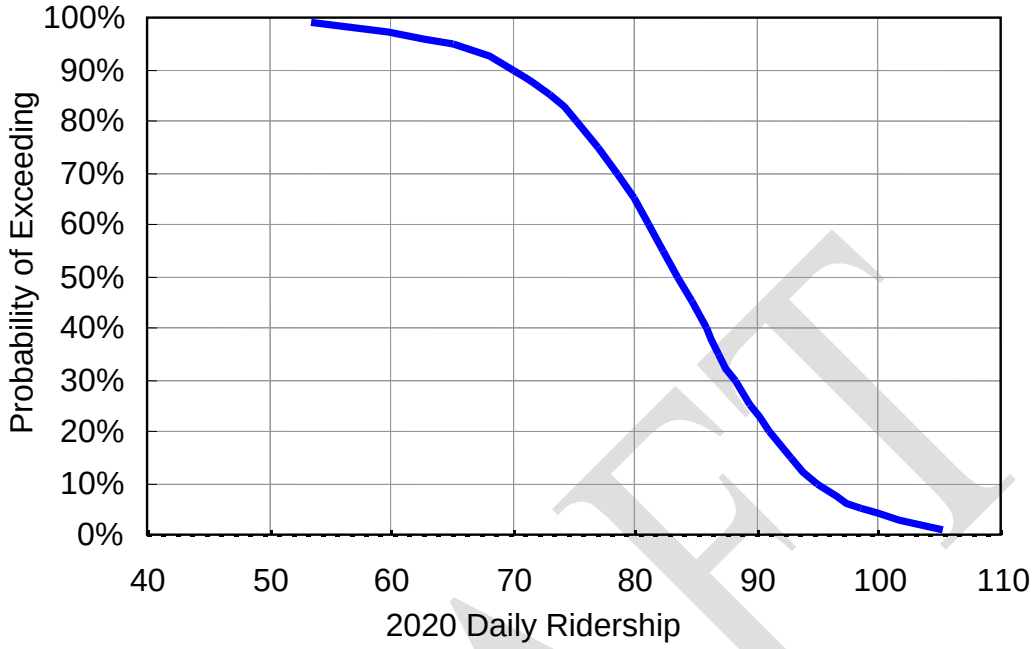
In a), the panel is invited to add variables and hypothesized causal relationships that may be material, yet missing from the model. In b), panelists are engaged in a discursive protocol during which the frequentist-based central estimates and ranges, provided to panelists in advance of the session, are modified according to panelist's beliefs.

Issue Risk Analysis

The final probability distributions are formulated by the risk analyst (HDR) based on input from the RAP session. These are combined using a statistical simulation technique (commonly known as Monte Carlo analysis) that allows each variable and forecasting coefficient to vary simultaneously according to its associated probability distribution. The end result is a central forecast, together with estimates of the probability of achieving

alternative outcomes given uncertainties in underlying variables and coefficients (see Figures below).

Risk Analysis of Annual Average Daily Boardings, *an Illustration*



Risk Analysis of Annual Average Daily Boardings, *an Illustration*

Projected Traffic	Probability of Exceeding Value Shown at Left
105.3	0.01
98.4	0.05
94.9	**0.10**
91.0	0.20
88.2	0.30
85.8	0.40
83.5	**0.50**
81.2	0.60
78.5	0.70
75.2	0.80
71.3	**0.90**
65.0	0.95
53.5	0.99
82.9	**Mean Expected Outcome**

4.2 Model Development

Several steps were taken to ensure that the most reliable estimates of potential economic development along the Knowledge Corridor in the Pioneer Valley were generated. After

conducting interviews, gathering data and reviewing studies on similar projects, three broad scenarios were developed: 1) baseline population and employment growth; 2) Enhanced service; and 3) Commuter service. Enhanced service would provide a level of service similar to the Portland-Boston Downeaster service (approximately 5-6 trains daily in each direction) and Commuter service would provide more frequent service particularly in the morning and afternoon commutes. It is believed that the higher the level of service, the more economic development would occur. In addition, the following factors were considered in the analysis:

- The geographic location of the station and the proximity of the potential development,
- Planned development projects,
- Land available for development by zoning,
- The number of jobs and people per building square feet and use,
- The relative size of a building compared to the size of the available parcel, and
- The results of similar studies to provide context and comparison for results generated in this PVPC rail study.

First, the population and employment forecasts for the region were examined to provide a baseline of projected growth to the year 2030, given no change in service. These estimates are then used as a level of comparison for potential development attributable to different levels of service. Both the Pioneer Valley Planning Commission and the Franklin County Transportation Planning Organization released Regional Transportation Plans (RTPs) in 2007. These plans include forecasts of employment and population at the municipality level to 2030. For the purposes of this analysis, seven different areas were examined: the four station cities - Greenfield, Northampton, Holyoke, and Springfield - and the three "rest of county" areas - Franklin, Hampshire and Hampden. The "rest of county" areas do not include the station cities and while the impacts will not be as large as the municipalities with stations, similar studies show that there will likely be some level of "spill over" development.[3]

Both the Pioneer Valley and Franklin County population forecasts used year 2000 Census data as the base for their projections. In order to incorporate the most recently available data, the growth rates that were developed in the RTPs were applied to 2007 U.S. Census population estimations. Since the 2007 population estimates are slightly lower than the 2000 populations for some of the municipalities, the projected 2030 populations that are presented in this report (see

[3] See: "Economic Benefits of Amtrak Downeaster Service", February 2005.

Table 1) are actually lower than those presented in the RTPs.

Table 1: Most Likely Population and Employment Estimates

Geographic Area	POPULATION 2007	POPULATION 2030	EMPLOYMENT 2007	EMPLOYMENT 2030
Greenfield	17,706	18,049	10,125	10,996
Rest of Franklin County	53,896	67,531	16,767	18,349
Northampton	28,411	28,752	18,374	18,619
Rest of Hampshire County	124,736	134,174	40,570	41,164
Holyoke	39,737	38,447	21,972	21,143
Springfield	149,938	152,289	75,896	71,112
Rest of Hampden County	268,233	284,420	100,840	104,568
TOTAL	682,657	723,662	284,544	285,951

Sources: US Census Bureau 2000 Census of Population & Housing; U.S. Census Bureau – 2007 Population Estimates, released July 2008; FRCOG Regional Population Projections 2000-2030; Regional Transportation Plan for the Pioneer Valley MPO – 2007 Update; Pioneer Valley Regional Transportation Plan; Franklin County Regional Transportation Plan; Massachusetts Office of Workforce Development ES-202; HDR Calculations.

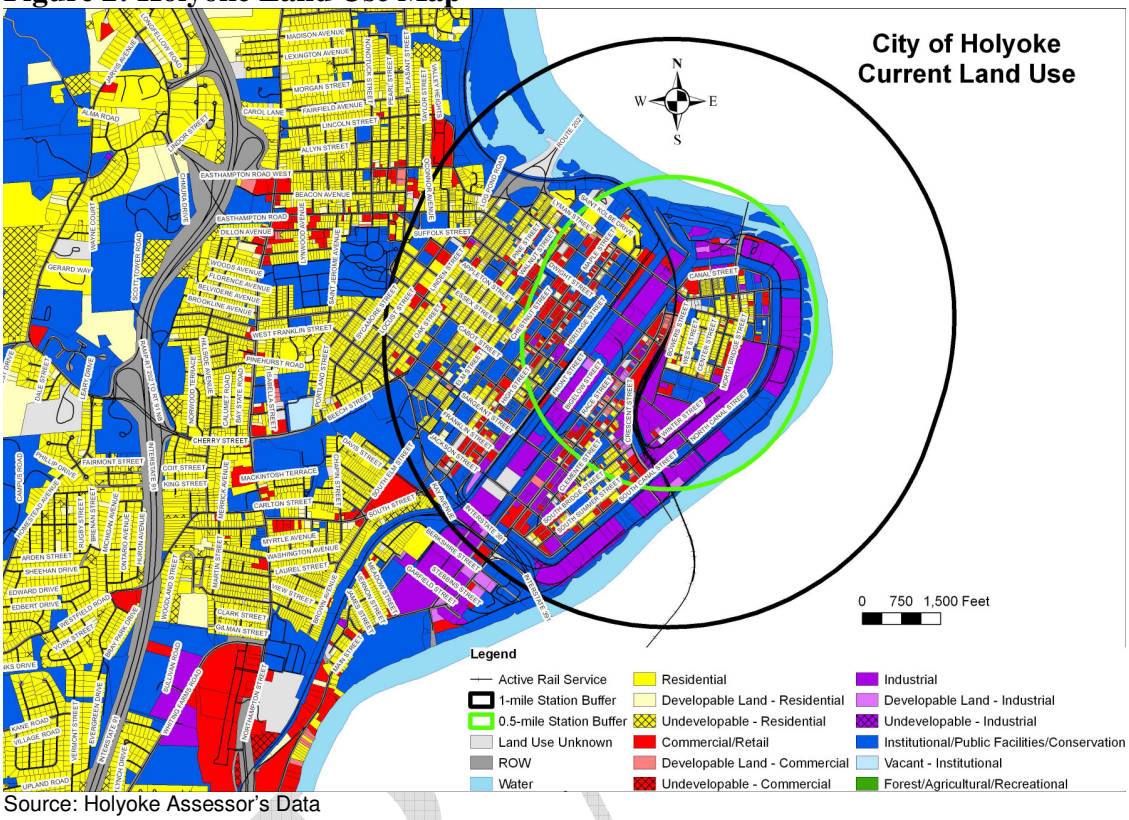
Similarly, the employment forecasts to 2030 use the year 2000 employment data as a base. The Pioneer Valley RTP uses 2000 Covered Employment and Wage data and Franklin County uses U.S. Census Bureau and Bureau of Labor Statistics data from the year 2000 as the base. Again, to ensure that the projections are using the most recently available data, 2007 employment data from the Massachusetts Office of Workforce Development was used as the base for calculations in this report. Similar to the population estimates, the growth rates used in the RTPs were applied to this updated data to calculate employment projections to 2030. The results of the baseline employment forecast can be seen above in Table 1.

Once the growth rates for population and employment were calculated, a risk factor was applied to the growth rates in order to generate a range of feasible projection estimates. These population and employment projections were also used to estimate impacts for increased service by calculating a percentage of the growth attributable to rail service for each of the station and rest of county areas. A risk range was also applied to these "growth attributable to rail" scenarios to account for possible variations in the future. The percentage of growth attributable to rail was greater in the commuter rail scenario than the enhanced rail scenario. The growth was tended to be larger in the station cities rather than in the "rest of county" areas due to proximity to rail. These results were used as a basis for comparison in some cases, and in Greenfield and the "rest of county" areas were used as the final projections of development and growth (given a lack of detailed, comprehensive land use data). Due to the additional land use data available in Northampton, Holyoke, and Springfield, the baseline growth estimates were used as an input, along with other factors that are described below, to generate more detailed induced development results.

For the more detailed analyses, where possible the station cities were further broken down by proximity to the proposed station location. The planned development projects provided by each city and the assessor data on available land was distinguished by parcels within a radius of ½ mile of the station, within 1 mile of the station, and more

mile walking distance, there is still increased potential within 1 mile, and this diminishes in areas beyond 1 mile from the station consistent with a gravity model approach.

Figure 2: Holyoke Land Use Map



Source: Holyoke Assessor's Data

Economic development professionals provided lists of planned development projects for the cities of Greenfield, Northampton, and Holyoke. From these project lists, details were provided on the geographic proximity to the station location (within ½ mile, within 1 mile and beyond 1 mile), and the type of development (residential, office, retail, or industrial). This data, along with the number of jobs or population per 1,000 square feet and other factors entered into the model to estimate the potential employment and population generation from the realization of these projects. The amount of jobs or population per 1,000 square feet was calculated based on usage rates as shown in Table 2. While these projects are all planned, risk factors are applied to the data to estimate the potential development that is attributable to rail.

Data on vacant but developable land was provided for the cities of Northampton, Holyoke and Springfield. This data was analyzed similarly to that of the planned development projects: it was first broken down by land use type and geographic proximity to the station, and then risk factors were applied to account for development attributable to rail, as well as the ratio of the parcel size to the building square footage. Since the data provided were simply for the parcels and not planned buildings, it was necessary to create a ratio of building square-footage to parcel size. Since zoning requirements are different for buildings of different usage types and in different locations – i.e. central business district or industrial park – several ratios were calculated.

Since the data provided were simply for the parcels and not planned buildings, it was necessary to create a ratio of building square-footage to parcel size. Since zoning requirements are different for buildings of different usage types and in different locations – i.e. central business district or industrial park – several ratios were calculated. Generally, the farther away the parcel was from the station, the smaller the ratio. These ratios were then used to estimate the size of the building to be used as an input for jobs or residents per 1,000 square feet of development. Further explanation of the risk analysis can be found in Section 4.1.

Table 2: Economic Development Model Inputs

Inputs	Mean	Low	High
Baseline Population Growth			
Greenfield	2.0%	0.8%	3.0%
Northampton	1.8%	-0.5%	2.4%
Holyoke	-4.0%	-5.8%	0.0%
Springfield	1.7%	0.0%	3.0%
Rest of Franklin County	25.3%	19.2%	31.4%
Rest of Hampshire County	8.0%	4.2%	10.5%
Rest of Hampden County	6.1%	3.0%	9.0%
Baseline Employment Growth			
Greenfield	10.0%	4.0%	12.0%
Northampton	1.0%	-1.0%	4.0%
Holyoke	-4.0%	-7.3%	0.0%
Springfield	-7.0%	-11.9%	0.0%
Rest of Franklin County	10.1%	4.1%	14.1%
Rest of Hampshire County	1.4%	0.0%	3.0%
Rest of Hampden County	3.5%	1.2%	6.4%
Jobs and Population per 1,000 Square Feet of Development			
Retail	1.7	1.2	2.5
Industrial	0.8	0.5	1.2
Office	2.8	2.0	3.5
Residential	1.5	1.2	1.8
Building Square Feet to Parcel Size Ratio			
Distance Less than 0.5 Miles from Station			
Retail	1.1	0.9	1.5
Industrial	0.8	0.6	1.1
Office	1.1	0.9	1.5
Residential	1.6	1.3	2.3
Distance Between 0.5 and 1 Mile from Station			
Retail	0.8	0.7	1.1
Industrial	0.6	0.4	0.8
Office	0.8	0.7	1.1
Residential	1.4	1.2	2.0
Distance Greater than 1 Mile from Station			
Retail	0.7	0.6	1.0
Industrial	0.5	0.4	0.7
Office	0.7	0.6	1.0

Residential	0.7	0.5	1.0

Source: HDR Calculations based on information gathered and feedback from TAC.

4.3 Induced Growth Assumptions

Risk analysis-based estimates of jobs and population from the scenarios discussed above were then compared and contrasted (as available) to derive low, median and high development potential estimates. As a point of comparison, the methodology from the Downeaster economic impact study[4] was applied to the Knowledge Corridor study area to ensure that the results obtained from the analyses were reasonable and not overly optimistic. After the draft results were generated, the key assumptions and risk factors were presented to the Technical Advisory Committee (TAC) for review (see Appendix B for participants in the Risk Analysis Process workshop). Revised risk factors were used to generate the final results presented in this document. The estimates that were based on actual planned development projects in each city were lower than the total estimate when all available development opportunities were considered, and thus we consider the development effects to be a composite of planned development projects as well as longer-term development of vacant and underutilized properties.

The additional population and employment growth attributable to rail based on differing service levels was used for Greenfield and the "rest of county" areas due to the data constraints. Since more specific land use data was available for Northampton, Holyoke, and Springfield, these results were primarily based on the detailed land use data with comparison to the planned projects and employment and population growth attributable to rail data. The assumptions on the percent of development of all vacant and developable land attributable to rail in terms of population and employment for both enhanced and commuter service are presented in Table 3 and Table 4.

Table 3: Enhanced Service Assumptions

Enhanced Population				
	Distance from Station	**Median**	**Low**	**High**
Greenfield		1.0%	0.5%	2.5%
Northampton	Less than 0.5 miles	15.0%	15.0%	30.0%
	0.5 to 1 mile	7.5%	7.5%	15.0%
	Greater than 1 mile	1.0%	1.0%	2.0%
Holyoke	Less than 0.5 miles	10.0%	10.0%	17.0%
	0.5 to 1 mile	8.0%	8.0%	14.0%
	Greater than 1 mile	1.1%	1.1%	2.0%
Springfield	Less than 0.5 miles	8.0%	8.0%	13.0%
	0.5 to 1 mile	6.0%	6.0%	11.0%
	Greater than 1 mile	3.0%	3.0%	6.0%
Rest of Franklin County		0.75%	0.5%	2.0%
Rest of Hampshire County		1.0%	0.5%	2.5%

[4] "Amtrak Downeaster: Overview of Projected Economic Impacts" for the Northern New England Passenger Rail Authority by the Center for Neighborhood Technology, March 2008.

Rest of Hampden County		0.5%	0.25%	1.0%
Enhanced Employment				
	Distance from Station	**Median**	**Low**	**High**
Greenfield		1.0%	0.5%	2.0%
Northampton	Less than 0.5 miles	15.0%	5.0%	30.0%
	0.5 to 1 mile	10.0%	2.5%	25.0%
	Greater than 1 mile	2.0%	1.0%	4.0%
Holyoke	Less than 0.5 miles	8.0%	3.0%	12.0%
	0.5 to 1 mile	6.0%	3.0%	9.5%
	Greater than 1 mile	3.0%	1.0%	6.0%
Springfield	Less than 0.5 miles	9.5%	4.0%	17.0%
	0.5 to 1 mile	7.5%	2.0%	14.0%
	Greater than 1 mile	1.0%	0.4%	1.2%
Rest of Franklin County		0.7%	0.3%	1.5%
Rest of Hampshire County		1.5%	0.75%	2.5%
Rest of Hampden County		0.3%	0.2%	0.5%

Source: HDR Calculations.

Table 4: Commuter Service Assumptions

Commuter Population				
	Distance from Station	**Median**	**Low**	**High**
Greenfield		3.0%	1.5%	6.0%
Northampton	Less than 0.5 miles	20.0%	7.0%	35.0%
	0.5 to 1 mile	12.0%	5.0%	25.0%
	Greater than 1 mile	1.3%	0.7%	2.0%
Holyoke	Less than 0.5 miles	22.0%	12.0%	30.0%
	0.5 to 1 mile	20.0%	10.0%	27.0%
	Greater than 1 mile	2.5%	0.3%	3.5%
Springfield	Less than 0.5 miles	23.0%	12.0%	36.0%
	0.5 to 1 mile	21.0%	10.0%	33.0%
	Greater than 1 mile	6.0%	3.0%	10.5%
Rest of Franklin County		2.5%	1.5%	4.0%
Rest of Hampshire County		2.0%	1.0%	3.0%
Rest of Hampden County		1.0%	0.5%	2.5%
Commuter Employment				
	Distance from Station	**Median**	**Low**	**High**
Greenfield		2.5%	1.25%	5.0%
Northampton	Less than 0.5 miles	20.0%	7.0%	35.0%
	0.5 to 1 mile	12.0%	5.0%	25.0%
	Greater than 1 mile	3.0%	2.0%	5.0%
Holyoke	Less than 0.5 miles	20.0%	10.0%	27.0%
	0.5 to 1 mile	18.0%	8.0%	22.5%
	Greater than 1 mile	8.0%	3.0%	12.0%

Springfield	Less than 0.5 miles	17.0%	5.0%	25.0%
	0.5 to 1 mile	11.0%	3.0%	22.0%
	Greater than 1 mile	3.0%	1.5%	5.0%
Rest of Franklin County		2.0%	1.0%	3.5%
Rest of Hampshire County		2.0%	1.0%	3.0%
Rest of Hampden County		0.75%	0.5%	1.5%

Source: HDR Calculations with input from the TAC.

All of the factors presented above were reviewed at the RAP workshop and refined, as appropriate, based on stakeholder feedback and data. Of note, the development growth differences for Northampton between the Enhanced and Commuter scenarios is relatively small compared to the other cities reflecting the economic opportunities that are less tied directly to commuting markets, and more focused on the creative economy. The risk ranges for Holyoke tend to be largest when taking into account recent and current economic market conditions balanced against the promising urban renewal initiatives currently underway. Finally, it is worth repeating that for Springfield, Holyoke, and Northampton, the growth percentages only apply to vacant development parcels while the growth percentages for the other areas are related to overall employment and population data.

5 RESULTS

This section provides a detailed presentation of the anticipated future economic development induced by passenger rail in the Pioneer Valley. Results are presented for three future scenarios:

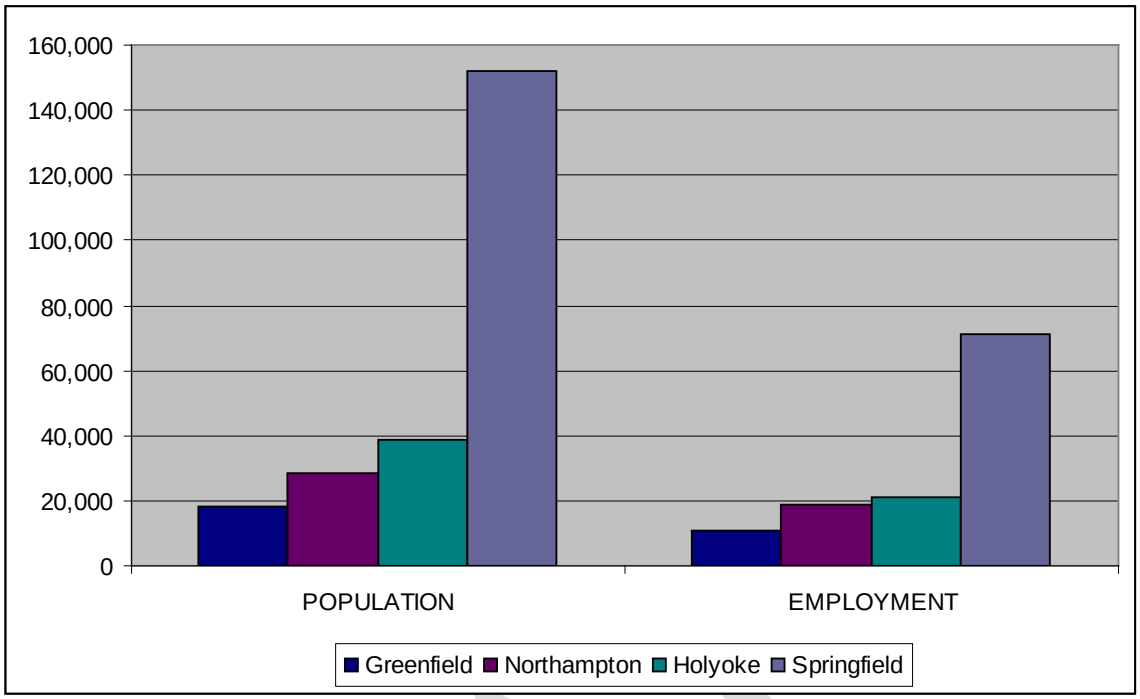
1. A baseline scenario with no change to the current passenger rail alignment.
2. Enhanced Passenger Rail service, providing approximately 5-6 daily trains in each direction.
3. Commuter Service providing more frequent service, particularly during the morning and evening rush hours.

For each scenario, results are presented based on the risk analysis model discussed previously. Each set of results will indicate the "most likely" predicted result (50%) as well as 10% (Low) and 90% (High), which are the upper and lower ends of the confidence interval. For the purposes of interpretation, the 10% or Low result means that there is a 10% chance that the growth in population or employment will be less than the reported value (i.e., 90% chance that it will be at least that large). The 90% or High value means that there is a 90% chance that the population or employment growth will not exceed that value.

5.1 Baseline Employment and Population Growth

Regardless of whether or not the realignment and enhancement of passenger rail service along the Knowledge Corridor occurs, there will be changes to both population and employment between now and 2030. Based on the information presented previously, forecast growth in both population and employment are relatively flat throughout the region. While Massachusetts is generally a slow-growth state, the Pioneer Valley Region tends to grow even more slowly. In some areas, such as Holyoke and Springfield, the actual forecast employment growth is negative. The results of the baseline analysis reflect the traditionally slow growth of the area as well as a range of options that considers the potential benefits from planned projects in the area contributing to growth. The most likely results from the baseline growth scenario were presented earlier in Table 1 and below in Figure 3. Additionally, Table 5 below shows the results of the risk range accounting for uncertainty in the future.

Figure 3: Baseline Population and Employment for Station Cities, 2030



Source: HDR Calculations based on Franklin County and Pioneer Valley Regional Transportation Plan Forecasts.

Table 5: Range of Population and Employment Estimates

Geographic Area	POPULATION 2030	EMPLOYMENT 2030
Greenfield	17,848 - 18,237	10,530 - 11,340
Rest of Franklin County	64,243 - 70,819	17,454 - 19,131
Northampton	28,269 - 29,093	18,190 - 19,109
Rest of Hampshire County	129,974 - 137,832	40,570 - 41,787
Holyoke	37,432 - 39,737	20,368 - 21,972
Springfield	149,938 - 154,436	66,863 - 75,894
Rest of Hampden County	276,278 - 292,372	102,050 - 107,293
TOTAL	703,982 - 742,526	276,025 - 296,526

Source: HDR Calculations based on Franklin County and Pioneer Valley Regional Transportation Plan Forecasts and Risk Analysis.

5.2 Development Attributable to Rail

A critical step of the process of determining the development impacts attributable to rail was calculating the amount of square footage to be developed in each of the station cities by land use type. The existing conditions parcel data was available for four usage types – retail, industrial, office and residential – and the shares of development attributable to each use were calculated from this data. The level of development attributable to rail varies by the service level scenario and City. The total square feet of development amounts shown in Table 6 and Figure 4 (below) were used as an input to calculate total employment and population impacts. Of note, the estimates provided below represent the

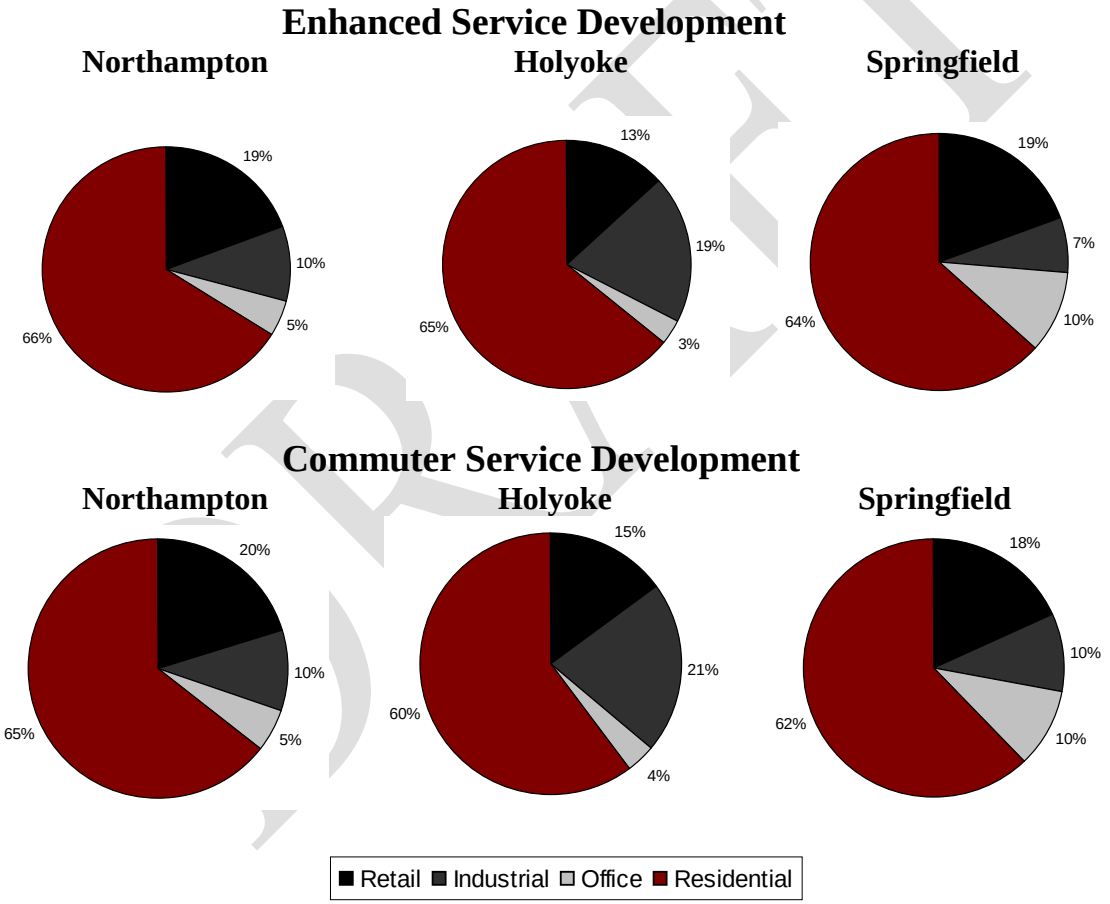
median results with a low to high range used to generate the risk range of economic development impacts.

Table 6: Square Footage of Development by Service Level, City, and Land Use, 2030

	Enhanced Service			Commuter Service		
	Northampton	Holyoke	Springfield	Northampton	Holyoke	Springfield
Retail	257,611	76,065	220,023	318,938	174,858	421,195
Industrial	129,732	110,074	80,180	158,980	247,815	224,031
Office	64,403	19,016	118,474	79,735	43,714	226,797
Residential	881,565	366,859	719,472	1,014,742	707,666	1,434,393
TOTAL	*1,333,312*	*572,014*	*1,138,149*	*1,572,394*	*1,174,053*	*2,306,416*

Source: HDR Calculations

Figure 4: Shares of Development by Service Level and City, 2030



Source: HDR Calculations.

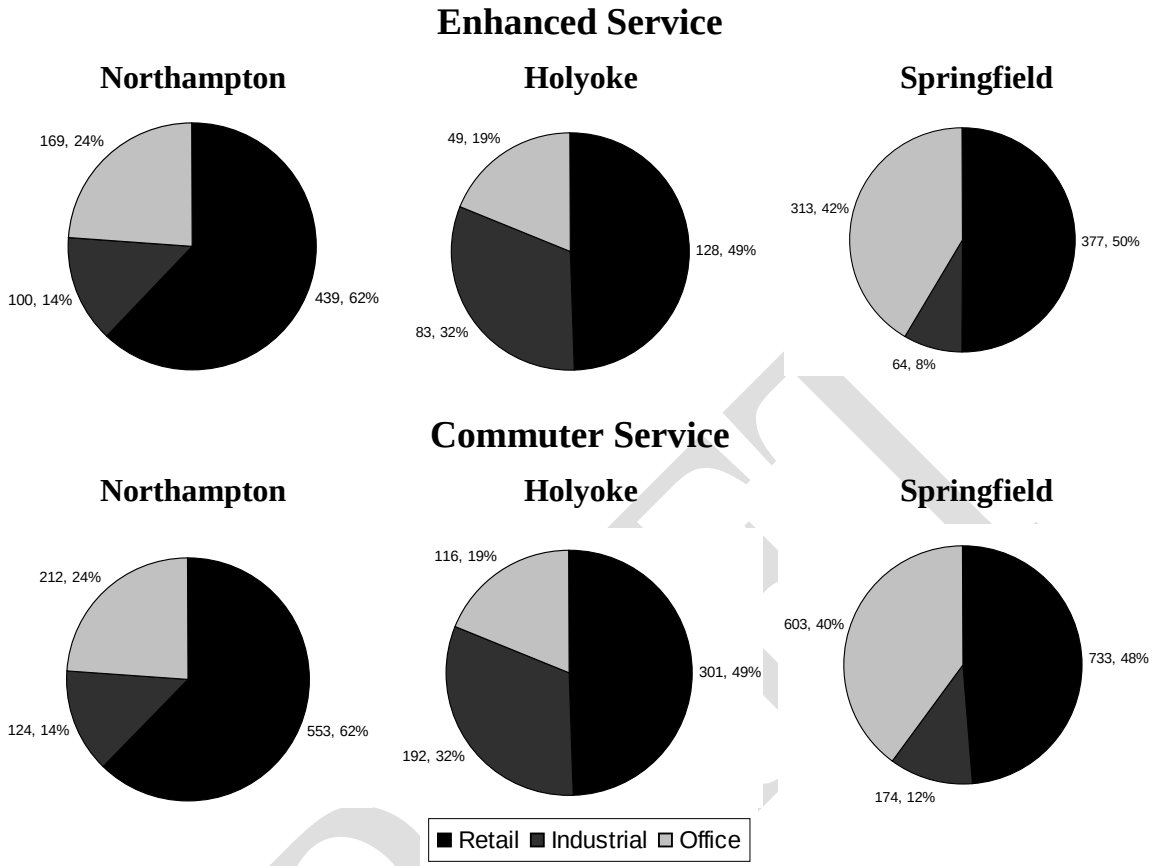
As is shown in Table 6, the amount of induced development in terms of square footage varies by service level and city. Northampton is expected to experience the most development in terms of square footage of building space due to the presence of Enhanced level service, with a most likely estimate of 1.3 million square feet by 2030. While Commuter level service is expected to generate additional development in Northampton, the majority of the impacts will likely occur in the presence of Enhanced

service due to the nature of the area and the strong desire for transportation alternatives. It is also estimated that Springfield should experience a fairly significant level of development due to enhanced level rail service, with more than 1.1 million square feet of total development attributable to rail. While the level of Enhanced service development is substantial, Commuter level service is expected to approximately double development, generating about 2.3 million square feet of total development. These results are generated from the development potential ranges found in Tables 3 and 4 above, and while the percentage development impacts in Springfield are relatively conservative (about 8 to 17 percent), it is worth noting that this long-term impact would represent a somewhat significant jump in office space absorption (in particular) compared to recent trends of about 20,000 square feet per year across Hampden County.

It is expected that Holyoke will take a slightly higher level of service to fully trigger development, which results in only slightly more than 0.5 million square feet of rail related development by 2030 for an enhanced service level. Similar to Springfield, Holyoke is expected to see greater benefits from Commuter level service, with development approximately doubling in the presence of Commuter service, to approximately 1.2 million square feet of development. While development in each of the cities is primarily residential, as Figure 4 shows, there is still expected to be a high level of commercial development in both Enhanced and Commuter scenarios. For both Springfield and Holyoke, in particular, this analysis and the risk ranges used to derive overall development results attempts to balance the *potential* for re-development with recent market conditions. In other words, the estimates are well within estimated impacts of development along the Downeaster rail corridor and other national case studies of transit-oriented development, but they also assume that the presence of rail service will be supplemented with other coordinated efforts to revitalize these cities, including public subsidies and public-private-university initiatives like the Computing Center in Holyoke.

The square footage of development is translated into population and jobs by using the population and jobs per 1,000 square feet factor discussed in Section 4.2. This step generates the most likely estimates for population and employment level, and furthers understanding of potential employment opportunities based on building and land use type. The differences in land availability across cities result in variation of types of employment as well, as demonstrated in Figure 5. Approximately two-thirds of Northampton commercial development is expected to be in retail space, with approximately one-quarter office and the remainder industrial, regardless of rail service level. Holyoke and Springfield are anticipated to each have about half of development in retail. Holyoke has more industrial space and less office, with approximately one-third of development anticipated to be industrial. Under an Enhanced service level Springfield can expect very little industrial development and a larger amount of office development. The composition of development and employment is projected to change slightly with Commuter level service, with a slight reduction in the shares of retail and office jobs and a slight increase in industrial employment.

Figure 5: Employment by Service Level, City, and Land Use: 2030



Source: HDR Calculations from Northampton, Holyoke and Springfield Assessor Data.

5.3 Summary Economic Development Results

The two scenarios examined for consideration of economic development impacts were Enhanced and Commuter Service. Both of these scenarios are expected to generate induced economic development, and as can be seen in Table 7. Aggregate results indicate a most likely result of about 2,700 jobs and 7,200 population in the Pioneer Valley by 2030 under the Enhance scenario with just over 5,500 jobs and 13,400 population in the Commuter scenario. As shown, the economic development impacts are not immediate as the results are significantly lower for 2015, reflecting the time needed to fully realize and leverage the economic development opportunities provided by rail. Almost 70% of the job impact is in the four station cities in the Enhanced scenario with 42% of the population effect, roughly consistent with current development patterns. The Commuter scenario has a slightly lower share of jobs and population in the four station cities as the effects are felt a bit more broadly throughout the region.

Table 7: Summary Induced Employment and Population Results by Scenario

	Enhanced				Commuter			
	Employment		Population		Employment		Population	
	2015	2030	2015	2030	2015	2030	2015	2030
Greenfield	32	128	61	243	80	321	159	634
Northampton	177	707	307	1,227	222	889	361	1,444
Holyoke	65	260	131	522	152	609	256	1,022
Springfield	189	754	250	998	378	1,510	502	2,006
Rest of Franklin County	38	153	187	746	99	396	451	1,802
Rest of Hampshire County	88	352	452	1,806	206	823	671	2,682
Rest of Hampden County	87	349	416	1,662	242	967	959	3,837
TOTAL	**676**	**2,703**	**1,804**	**7,204**	**1,379**	**5,515**	**3,359**	**13,427**

Source: HDR Calculations

5.4 Results for Enhanced Service Scenario

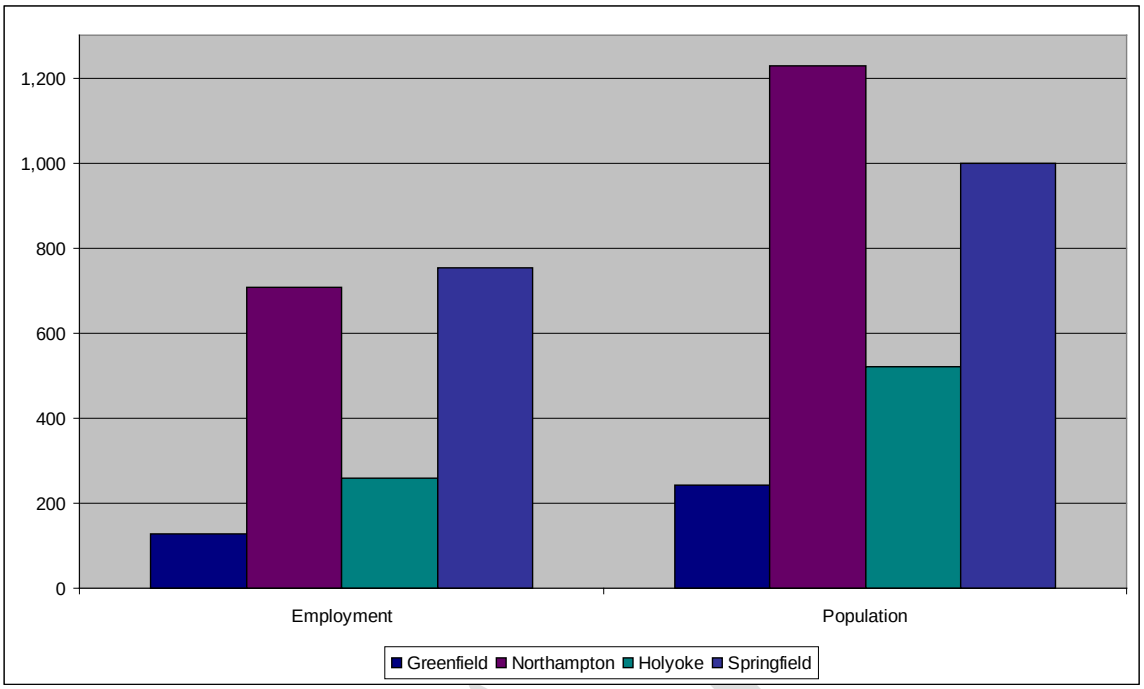
The employment and population impacts for the Enhanced scenario are presented in Table 8 below for 2015 and 2030, including the low to high risk ranges. Additionally, Figure 6 provides a comparison with the most likely employment impacts for year 2030. In terms of most likely development, Northampton is expected to have the largest population impacts, partly due to the strong desire for alternative transportation in the area, attracting a range of 558 to 2,210 new residents by 2030. Springfield is also expected to see a fairly large impact with nearly 1000 new residents under the most likely scenario, while Holyoke and Greenfield are expected to experience slightly less population growth attributable to rail service. Considering the results of the risk analysis, Enhanced level rail service is estimated to induce between 3,057 and 12,579 new residents for the Corridor region as a whole by 2030, and between 1,517 and 4,998 jobs.

Table 8: Induced Employment and Population Attributable to Enhanced Service

	Employment						Population					
	2015			2030			2015			2030		
	10%	50%	90%	10%	50%	90%	10%	50%	90%	10%	50%	90%
Greenfield	14	32	55	55	128	219	23	61	113	90	243	451
Northampton	91	177	306	365	707	1,224	140	307	553	558	1,227	2,210
Holyoke	29	65	122	114	260	486	55	131	229	221	522	915
Springfield	102	189	311	409	754	1,242	118	250	452	472	998	1,807
Rest of Franklin County	14	38	69	55	153	274	84	187	338	337	746	1,353
Rest of Hampshire County	77	88	258	309	352	1,030	168	452	839	670	1,806	3,356
Rest of Hampden County	53	87	131	210	349	523	177	416	712	709	1,662	2,487
TOTAL	*380*	*676*	*1,252*	*1,517*	*2,703*	*4,998*	*765*	*1,804*	*3,236*	*3,057*	*7,204*	*12,579*

Source: HDR Calculations.

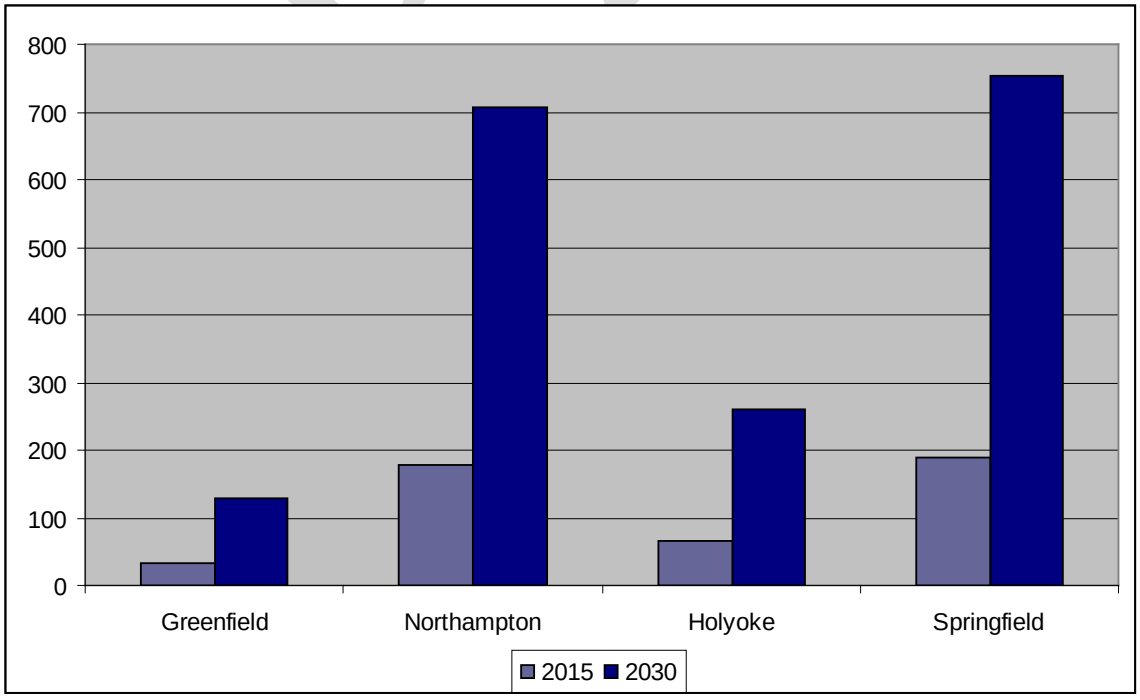
Figure 6: Induced Employment and Population in the Enhanced Scenario: 2030



Source: HDR Calculations.

Figure 7 below presents the most likely job results in 2015 and 2030 for the four station cities. Northampton and Springfield are expected to experience the highest increase in employment, with a most likely estimate of more than 700 new jobs in each city attributable to Enhanced rail service by 2030.

Figure 7: Induced Employment Impact in the Enhanced Scenario: 2015 and 2030



Source: HDR Calculations

Table 9: Development Impacts of Enhanced Service as Percent of Baseline Numbers

	Employment	Population
	2030	2030
Greenfield	1.2%	1.3%
Northampton	3.8%	4.3%
Holyoke	1.2%	1.4%
Springfield	1.1%	0.7%
Rest of Franklin County	0.8%	1.1%
Rest of Hampshire County	0.9%	1.3%
Rest of Hampden County	0.3%	0.6%
TOTAL	0.9%	1.0%

Source: HDR Calculations.

While the "rest of county" areas appear to substantial growth, when compared to the percentage of the baseline values, as shown in Table 9, the impacts for the station cities in their respective counties account for a larger percentage of the baseline than the "rest of county" areas do. On a percentage basis, the impacts for the Enhanced scenario are clearly the largest for Northampton with just impacts at about 4% of future levels. Impacts in the other areas are all approximately at or below 1.0%.

5.5 Results for Commuter Service Scenario

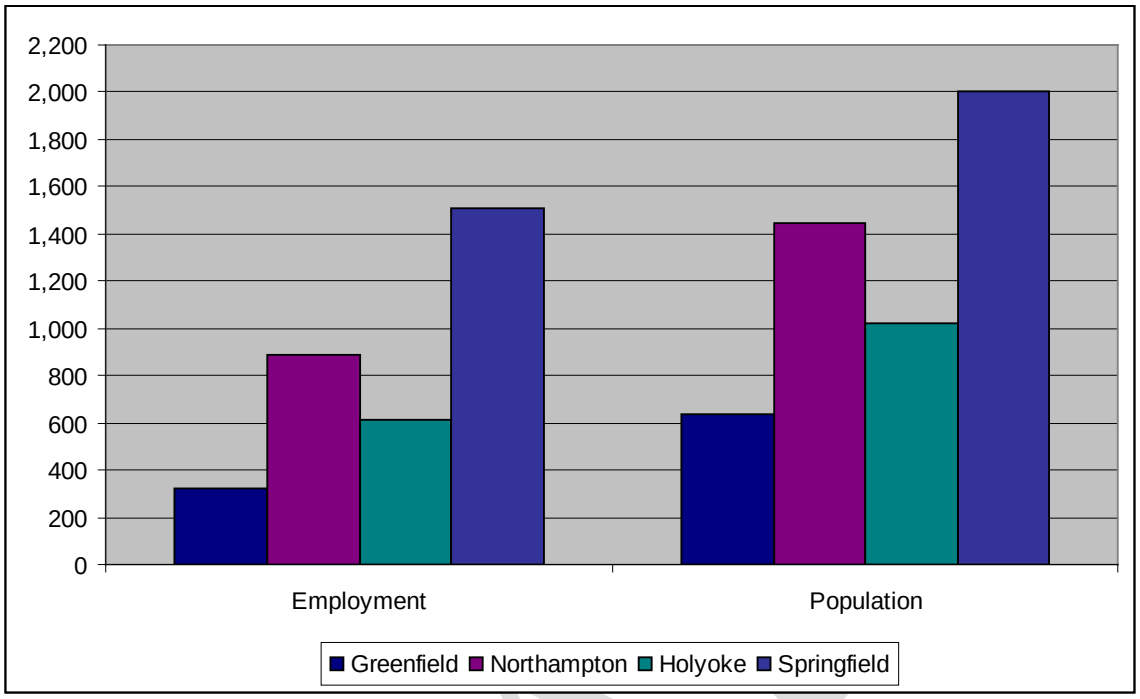
This section presents the results for the Commuter rail service scenario. In terms of most likely development, Springfield is expected to have the largest population impacts, due to its location and connections, attracting more than 2,000 new residents by 2030 with a range between 1,080 and 3,432 (Table 10 and Figure 8). Northampton and Holyoke are also expected to see fairly large impacts with more than 1,400 and 1,000 new residents respectively. While the anticipated 600 new residents seems relatively low compared to the other cities, this is considerable growth for Greenfield. The impacts for the region are nearly double over the Enhanced service level, with a range of 6,379 to 22,405 new residents by 2030.

Table 10: Induced Employment and Population Attributable to Commuter Service

	Employment						Population					
	2015			2030			2015			2030		
	10%	50%	90%	10%	50%	90%	10%	50%	90%	10%	50%	90%
Greenfield	34	80	137	137	321	548	68	159	270	270	634	1,080
Northampton	124	222	360	496	889	1,440	198	361	590	792	1,444	2,360
Holyoke	76	152	264	305	609	1,057	117	256	423	469	1,022	1,691
Springfield	207	378	612	827	1,510	2,447	270	502	858	1,080	2,006	3,432
Rest of Franklin County	46	99	160	182	396	640	252	451	677	1,009	1,802	2,709
Rest of Hampshire County	103	206	309	410	823	1,234	334	671	1,007	1,337	2,682	4,026
Rest of Hampden County	131	242	393	523	967	1,570	356	959	1,777	1,422	3,837	7,107
TOTAL	*721*	*1,379*	*2,235*	*2,880*	*5,515*	*8,936*	*1,595*	*3,359*	*5,602*	*6,379*	*13,427*	*22,405*

Source: HDR Calculations

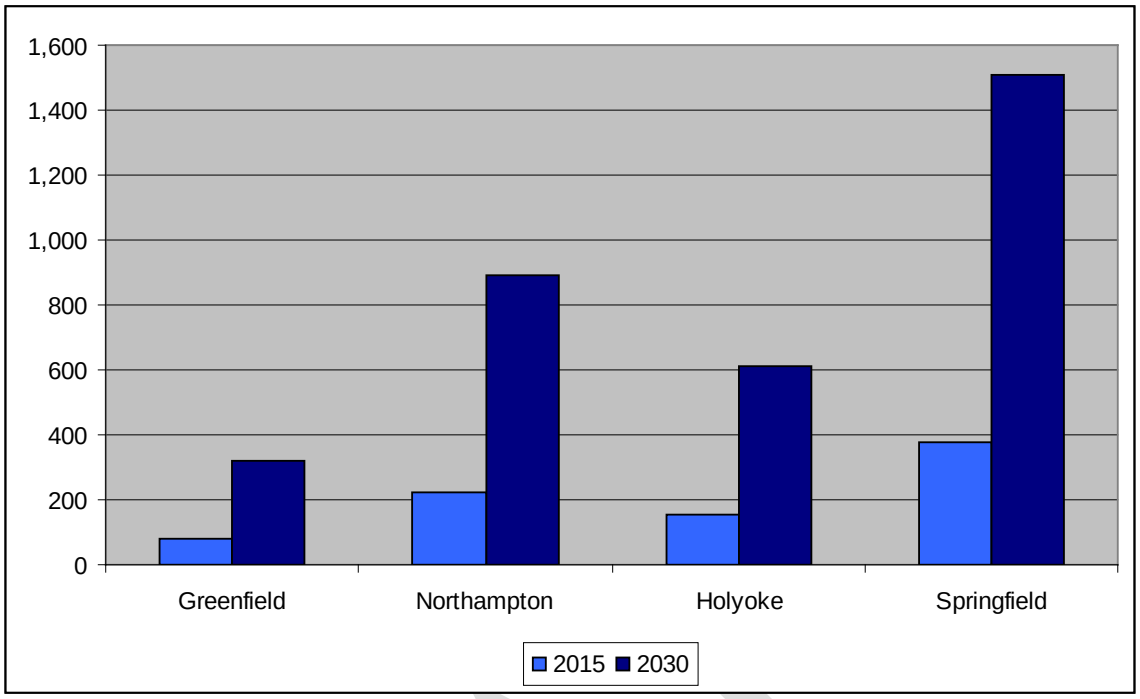
Figure 8: Induced Employment and Population in the Commuter Scenario: 2030



Source: HDR Calculations.

In addition to considering the development impacts on population, the introduction of Commuter rail service is expected to generate additional employment opportunities. The overall employment impacts in 2015 and 2030 can be seen in Table 8 (above) and Figure 9. Springfield is expected to experience the largest growth in employment, with a 2030 most likely estimate of 1,510 new jobs and a likely range between 827 and 2,447. This is approximately double the number of jobs generated in Springfield by the Enhanced level of rail service. In Northampton, the additional employment generated by Commuter service is slightly higher than in the Enhanced scenario but not as large as that in Springfield. As a whole, the region is estimated to see between 2,880 and 8,936 new jobs by 2030 due to a Commuter level of service, slightly less than double the Enhanced results.

Figure 9: Induced Employment Given Commuter Service: 2015 and 2030



Source: HDR Calculations

Table 11 presents the employment and population results as a percentage of baseline growth. While impacts compared to the baseline are still the largest in Northampton, the other station cities are all expected to experience additional benefit with the upgrade to Commuter level of service, with a regional average impact of about 2.0%.

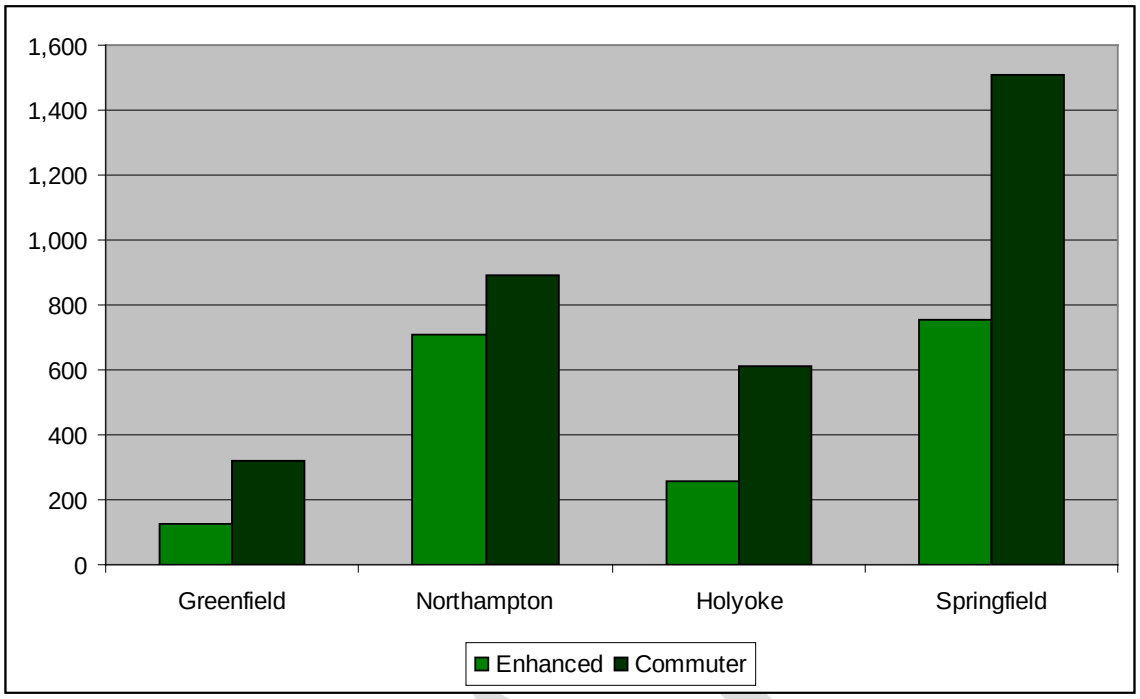
Table 11: Development Impacts of Commuter Service as Percent of Baseline

	Employment	Population
	2030	2030
Greenfield	2.9%	3.5%
Northampton	4.8%	5.0%
Holyoke	2.9%	2.7%
Springfield	2.1%	1.3%
Rest of Franklin County	2.2%	2.7%
Rest of Hampshire County	2.0%	2.0%
Rest of Hampden County	0.9%	1.3%
TOTAL	**1.9%**	**1.9%**

Source: HDR Calculations.

For ease of comparison, Figure 10 demonstrates a side-by side comparison of employment impacts in 2030 for the Enhanced and Commuter scenarios with the most likely results.

Figure 10: Induced Employment, Enhanced and Commuter Service: 2030



Source: HDR Calculations.

6 SUMMARY OF FINDINGS

The economic development results presented above were based on multiple sources of information (economic and land use data, prior studies, stakeholder interviews, etc.) and a risk analysis modeling approach that: 1) explicitly accounted for uncertainty and risk factors; 2) incorporated refinements and review by local stakeholders and experts; and 3) generated most likely results along with a confidence-interval based range of low to high impacts. These impacts were developed to serve two key objectives: providing induced development growth as an input to ridership estimates; and identifying and measuring the near- and long-term local and regional job and population effects of rail development initiatives. A summary of key findings includes:

- Enhanced service will most likely have the greatest impact in Northampton due to the characteristics of the city, while the other station cities are expected to incur greater development impacts from Commuter level service.
- The development impacts in 2015 are likely to be significantly smaller than those in 2030, due to the amount of time it generally takes for development to occur as well as the necessary time for the region to overcome its broader development and growth obstacles to fully leverage the benefits of rail.
- While the impacts may seem relatively large, when they are compared to the expected baseline employment and population in each of the cities and "rest of county" areas, the impacts attributable to the rail service are actually relatively modest, not exceeding 5% of the total for any area in the commuter scenario, and are less for the enhanced scenario. These economic estimates are consistent with the region's broader set of development initiatives (with rail being one component of broader plans). The induced job and population growth potential related to rail could help the region become more in line with growth in the rest of Massachusetts, and is consistent with the state's efforts to boost economic opportunities in Gateway Cities.
- The economic risk modeling estimates that there is a 90% chance that the region as a whole can expect development impacts in terms of employment and population of at least 1,500 jobs and 3,000 new residents by 2030 under Enhanced service and at least 2,800 jobs and 6,300 residents under Commuter service.

The improved rail service along the Knowledge Corridor is anticipated to provide employment and population impacts, the level of which will depend upon many factors, including the level of service, the timeframe in which the service is restored, and the region's ability to leverage rail improvements.

APPENDIX A: LIST OF STAKEHOLDER INTERVIEWS

Economic development interviews were conducted with:

- Franklin Regional Council of Governments – Maureen Mullaney and Peggy Sloan
- Northampton Economic Development – Teri Anderson
- Holyoke Office of Planning and Development – Kathy Anderson
- Economic Development Council of Western MA – Mike Graney
- HCC Kittredge Center – Jeff Hayes
- Springfield Office of Planning and Development – David Panagore
- Congressman Olver's Office – Natalie Blais and Kristin Wood
- Hayes Development Services – Maureen Hayes
- O'Connell Companies – Francesca Maltese
- Affiliated Chamber of Commerce of Springfield – Russell Denver
- University of Massachusetts – John Mullin
- University of Massachusetts Research Liaison and Development – Marla Michel

APPENDIX B: RAP SESSION PARTICIPANTS

TAC Subcommittee

Teri Anderson	Northampton Economic Development
Stan Slater	Amtrak
Natalie Blais	Office of Congressman John Olver
Kristen Wood	Office of Congressman John Olver
Matt Mann	Windham Regional
Syd Culliford	Pan Am Railway
Maureen Mullaney	FRCOG
Wayne Feiden	Feiden Associates
Kathleen Anderson	City of Holyoke Office of Planning and Economic Development

Project Team

Max Talbot-Minkin	Howard/Stein-Hudson Associates, Inc.
Dan Hodge	HDR, Inc.
Peter Mazurek	HDR, Inc.
Dana Roscoe	Pioneer Valley Planning Commission
Marissa Witkowski	HDR, Inc.
Ronald O'Blenis	HDR, Inc.
Charlie Miller	Vermont Agency of Transportation
Jeff McCullough	Pioneer Valley Planning Commission
Tim Brennan	Pioneer Valley Planning Commission

APPENDIX C: RAP COMMENTS AND RESPONSES

Several changes have been made to the Induced Economic Development and Ridership models for the Knowledge Corridor Passenger Rail study based on discussion among the Technical Advisory Committee at a meeting on January 29, 2009 as well as additional feedback from TAC members. These changes are documented below.

- The general consensus among the subcommittee was that the baseline population growth rates should be extended to account for larger variability. Additional feedback from Teri Anderson of Northampton and Kathy Anderson of Holyoke led to additional changes for those two towns. All of the changes are as follows:
    - Greenfield's low population was reduced from 1.5% to 0.8% and the high end was raised from 2.4% to 3.0%
    - The rest of Franklin County low population growth was lowered from 20.2% to 19.2% and the high end was raised from 30.4% to 31.4%
    - Based on feedback from Teri Anderson regarding further trends, all values for Northampton were changed. The low was reduced from 1.6% to -0.5%, the most likely was reduced from 3.8% to 1.8% and the high end was lowered from 4.6% to 2.4%
    - The rest of Hampshire County low estimate was reduced from 6.4% to 4.2% and the high was raised from 9.6% to 10.5%
    - Holyoke's most likely population has been raised from -4.8% to -4.0% and the high population growth has been raised from -3.8% to 0.0% based on the feedback of Kathy Anderson
    - Springfield's low population growth was lowered from 1.4% to 0.0% and the high was raised from 2.0% to 3.0%
    - The rest of Hampden County area was lowered from 4.7% to 3.0% and the high was raised from 7.3% to 9.0%

- Based on the consensus of the TAC and additional feedback from Teri Anderson and Kathy Anderson about their respective cities of Northampton and Holyoke, the following adjustments have been made to Baseline Employment Growth Rates to reflect the increased range and possible development in Northampton, Holyoke and Springfield. Additionally, the raw data from the 2007 ES-202 were used as the base 2007 employment numbers rather than the calculation that previously generated that year's employment numbers.
    - Greenfield: low reduced from 8.0% to 4.0%
    - Rest of Franklin County: low from 8.1% to 4.1% and high from 12.1% to 14.1%
    - Northampton: Most likely adjusted from -1.5% to 1.0%, low from -1.9% to -1.0% and high from 2.3% to 4.0%
    - Rest of Hampshire County: low reduced from 1.1% to 0.0% and high raised from 1.7% to 3.0%
    - Holyoke: Most likely increased from -6.1% to -4.0% and high raised from -4.9% to 0.0% based on the potential projects provided by Kathy Anderson
    - Springfield: most likely increased from -9.9% to -7.0% based on feedback at the RAP session about economic opportunities. The high was also raised from

-7.9% to 0.0%
    - Rest of Hampden County: Low reduced from 2.8% to 1.2% and high raised from 4.2% to 6.4%
- Trip Making Cost Variables
    - Based on feedback at the RAP session, high rail fare was increased from $0.29 to $0.30
    - Also based on the discussion, the most likely average fuel price was increased from $2.50 to $3.00 and the high fuel price was raised from $5.00 to $6.00.
- Trip Making Travel Time and Speed Variables
    - Average speed on rail has been divided into two assumptions, one for inter-city/enhanced and one for commuter
    - Average speed on highways high reduced from 60 to 55 based on discussion of the areas away from I-91 having lower speed limits.
- Jobs and Population per 1000 Square Feet of Development: based on feedback from Teri Anderson with assumptions used for a study in Northampton, the following adjustments were made:
    - Retail: most likely raised from 1.33 to 1.7, high raised from 1.5 to 2.5
    - Office: most likely lowered from 3.84 to 2.8, low reduced from 3.51 to 2.0 and high lowered from 4.02 to 3.5
- Building Square Footage to Parcel Size Ratio: based on recommendations from Teri Anderson and the Northampton planning director, the ranges have been increased on the high end as follows:
    - Retail: increased from 1.27 to 1.5
    - Industrial increased from 0.92 to 1.1
    - Office increased from 1.27 to 1.5
    - Residential increased from 1.90 to 2.3
- Building Square Footage to Parcel Size Ratio as Distance from Station Changes: based on discussion at the RAP session, ranges have been added for distances between 0.5 and 1 mile from the station as well as areas greater than 1 mile. They are as follows:
    - Distance between 0.5 and 1 mile
        - Retail: 0.70, 0.80, 1.10
        - Industrial: 0.40, 0.60, 0.80
        - Office: 0.70, 0.80, 1.10
        - Residential: 1.2, 1.4, 2.0
    - Distance Greater than 1 mile
        - Retail: 0.60, 0.70, 1.0
        - Industrial: 0.40, 0.50, 0.70
        - Office: 0.60, 0.70, 1.00
        - Residential: 0.5, 0.7, 1.0
- Northampton Economic Development Risk Factors: Residential growth rates greater than 1 mile from the station were reduced for both enhanced and commuter scenarios
    - Enhanced: Reduced from 1.5%, 3.0% and 6.0% to 0.5%, 1.0% and 2.0%
    - Commuter: Reduced from 2.0%, 4.0% and 6.0% to 0.7%, 1.3% and 2.0%
- Holyoke Economic Development Risk Factors: Residential growth rates greater than 1 mile from the station were reduced for both enhanced and commuter service scenarios due to the reduced impact of the service at this distance

- Enhanced: Reduced from 3.0%, 5.0%, 10.0% to 0.1%, 1.1%, 2.0%
- Commuter: Reduced from 6.0%, 10.0%, 15.0% to 0.3%, 2.5%, 3.5%

- Springfield Economic Development Risk Factors: Employment and population estimates have been adjusted
  - Employment:
    - Enhanced:
      - For businesses within 0.5 miles: from 2.0%, 4.0%, 5.6% to 4%, 9.5%, 17.0%
      - For businesses between 0.5 and 1 mile: from 0.75%, 2.50% and 4.0% to 2.0%, 7.5%, and 14%
      - For businesses farther than 1 mile: from 0.05%, 0.25% and 0.4% up to 0.4%, 1.0%, and 1.2%
    - Commuter:
      - For businesses within 0.5 miles: from 3.0%, 7.0% and 10.0% to 5.0%, 17.0% and 25.0%
      - For businesses between 0.5 and 1 mile: from 2.0%, 4.0% and 6.0% to 3.0%, 11.0% and 22.0%
      - For businesses farther than 1 mile: from 0.5%, 1.0% and 2.5% to 1.5%, 3.0%, 5.0%
  - Population:
    - Enhanced:
      - Residential within 0.5 miles: from 2.4%, 5.6% and 8.0% to 5.0%, 8.0%, and 13.0%
      - Residential between 0.5 and 1 mile: from 1.2%, 4.0%, and 6.0% to 3.0%, 6.0% and 11.0%
      - Residential farther than 1 mile: from 0.2%, 0.8% and 2.4% to 1.5%, 3.0%, 6.0%
    - Commuter:
      - Residential within 0.5 miles: from 6.0%, 10.0% and 13.0% to 12.0%, 23.0% and 36.0%
      - Residential between 0.5 and 1 mile: from 4.0%, 8.0%, and 10.0% to 10.0%, 21.0% and 33.0%
      - Residential farther than 1 mile: from 2.5%, 5.0% and 8.0% to 3.0%, 6.0% and 10.5%

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Appendix G Comments and Responses

This chapter presents the comments received on the EA from members of the public, government agencies and nongovernment organizations during the public comment period. The public comment period was from September 23 through October 14, 2009. This chapter also includes responses to all comments received on the EA.

Table G-1 Public Comments and Responses

To whom it may concern: I read in my local paper (the Springfield Republican) today that you are requesting feedback about proposed changes to the Vermonter. I've never taken this train, but If there were a frequent and inexpensive rail link between Springfield and Northampton, I would likely make use of it for recreational purposes (visiting Northampton for shopping, coffee, walking around). I usually visit Northampton at least once a week, and would love to take the train rather than drive, if it were inexpensive and convenient. I also really support the idea of making Palmer a rail hub. I frequently work in Boston, sometimes driving in as often as three times per week. I would LOVE not to have to drive through rush hour traffic. If I could drive to Palmer and take a train into Boston during normal business hours, I'd be very very happy. While I think the proposed Springfield -- New Haven commuter rail is a great idea, and I would probably use it (I drive to New Haven maybe once every two months), and would probably go to NY more frequently with it, I think the majority of people in Western Mass go to Eastern Mass a lot, and if we could take the train there, it would be so much easier. Anything that brings more passenger rail to Springfield has a potential for economic development for the city, and I support it for that reason, but for my own business usage, I'd love west-east travel with a Palmer hub (taking a train straight from Springfield to Boston is my ideal, but I guess that's not happening any time soon). Sincerely, Erica Walch 29 Mattoon Street Springfield, MA 01105	Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts. EOT recognizes the interest for passenger service in Palmer. EOT is in the process of a High Speed Rail Study on the "Inland Route" between Boston, Worcester, Springfield and New Haven. This study is expected to develop a Service Development Plan for this portion of the Northern New England High Speed Rail Corridor. The “Inland Route” passes through Palmer, and a new station in Palmer will be specifically analyzed in the study. EOT also submitted a Track 1b grant application for Preliminary Engineering and Environmental Work for double tracking the Inland Route from Springfield to Worcester including Palmer. This application also anticipates a potential station in Palmer. We encourage you to stay informed regarding potential regional opportunities to provide connections between bus and rail. Please visit http://www.eot.state.ma.us/ or www.pvpc.org.

Please add my voice to the ones in favor of rerouting Amtrak to the old Connecticut River route through Northampton and Greenfield. I believe the route was originally rerouted through Amherst due to poor track conditions on the Conn. River line. Since stimulus money would upgrade that line, it seems like a no brainer to send the trains back over the Conn. River line to potentially serve 3 cities (Northampton, Greenfield, and Holyoke) on that line instead of the one (Amherst) which is served now, plus save 50 minutes off the time of travel in the process. Thank you. Edward Sherman Easthampton, MA 01027	Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

I wish to ad my support to the proposed change in route of the Vermonter in Western Mass. The route along the Connecticut River is a scenic plus and one that would greatly enhance the attractiveness of this journey. I sincerely hope that every effort will be made to continue to improve and foster use of our rail system which holds an important piece of reducing our dependence on foreign oil. Furthermore, I am convinced that if more people can experience the pleasure of riding through our scenic countryside free of the stress associated with highway travel they will learn to appreciate this great mode of transportation. I have long been an advocate of rail travel and applaud you in your effort to improve our rail system. Sincerely, Rene A. Desmarais 49 Percy St. Chicopee, MA 01020 radesmarais@charter.net	Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

Gentlemen, I note that you are accepting comments on thr rerouting of the Vermonter through Massachusetts. I am hoping that it may be possible to continue serving Amherst by rail. When I first joined the UMass faculty in 1950, I did not own a car and depended upon quite good rail transportation for travel to and from Amherst. Over the years, this has deteriorated, motivating me to travel by car. I believe measures to promote rail transportation is a step in the right direction to achieving a green economy. I have corresponded with former Governor Dukakis about this matter. As you know, he formerly headed Amtrak and was frustrated by lack of financial support by the government. He has suggested that if the train route through Amherst is abandoned, shuttle buses should be scheduled to permit convenient train connections. While this is a possibility, I believe that train connections, either through a direct line or a shuttle should be considered. I was a graduate student at Princeton University where there was a train shuttle between Princeton and the main railway line at Princeton Junction. I found this quite satisfactory and well used. With UMass being considerably larger than Princeton and growing, this option might be reasonable. I welcome your efforts to improve public transportation. Richard S. (Dick) Stein Goessmann Professor of Chemistry, Emeritus University of Massachusetts, Amherst	Thank you for your comments. We appreciate your support in our efforts. Under the Proposed Project, Amtrak service (e.g. the Vermonter) would no longer be provided in Amherst. Instead, stations would be located in Northampton and Greenfield. Section 3.3.1 of the EA, describes existing bus service in Amherst, Greenfield, and Northampton that would provide connections to the proposed stations. In addition, the General Plans of Northampton, Greenfield and Amherst identify goals to enhance bus service that will compliment the planned inter-modal hubs and railroad stations for the Proposed Project.

As the parent of a college student in Vermont I would like to express my thoughts on adding a stop in Northampton for the Vermonter. My daughter is in her freshman year at St. Michael's College in Burlington, we reside in Conway, MA. I have already purchased the Amtrack student discount card for two years for her to use when she travels back and forth from school to home. After calculating the cost for gas, and the time spend on a round trip drive to pick her up it made the most sense to us for her to use the train. From what I see on the schedule she will need to be picked up in Amherst, which is truly not too bad but adding a stop in Northampton would help us tremendously. Over the next four years we anticipate much travel from VT to Mass and having an economical way to do so would be fantastic! Thank you Kimberly Clairemont Conway MA	Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

I believe that adding more stops in Western Massachusetts would be very good. I certainly favor a stops in Greenfield and Northampton as as they are accessable and would encourage economic growth plus be a great convenience for additional passenger travel. I would certainly use the train if such service weere instituted. Thank you. James B Makos Northfield, MA -- James B. Makos	Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

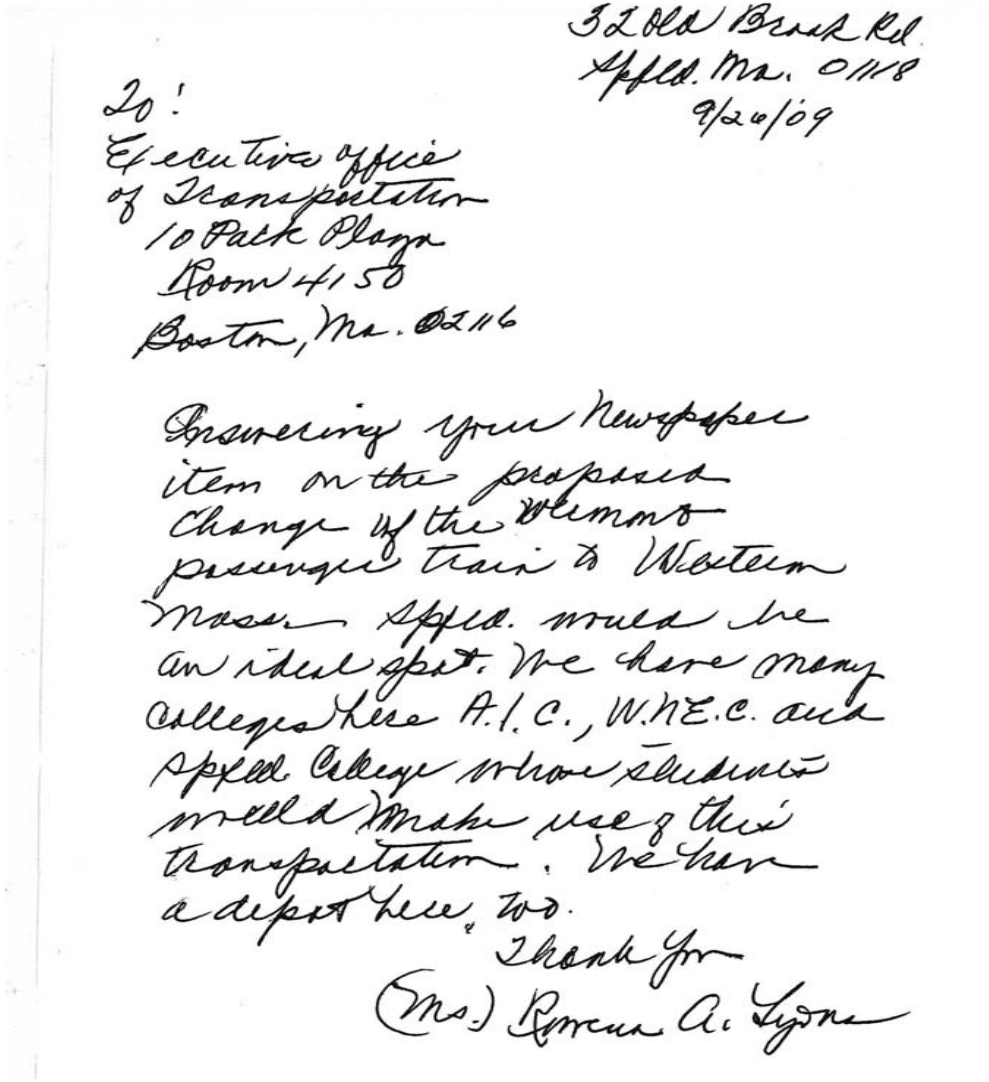
TIM PARKER POB 274, Ware, MA 01082 Colin Durrant of EOT asked for comments on the Vermonter Passenger Train changes for another $69 million, but fails to mention how much the train is already subsidized by taxpayers, the utilization and make-up of the riders. How can a taxpayer who doesn't use the service make a decision without adequate information ? No wonder Dana Roscoe of the PVPC didn't think people would complain about another multimillion boondoggle when we're wasting billions and trillions on too many other things. Are we paying for 80% of the costs when the trains are less than 20% full with 50% of the riders making more income than the average taxpayer ? Do the riders constitute more than 2% of the general population ? We don't subsidize cars, buses, planes or the trucking industry. Instead we use the tax revenues generated by them to pay for all kinds of entitlement programs instead of repairing roads/bridges or putting in adequate airport parking that doesn't cost more than the airfare. I don't think the Government should be in the railroad business at all. How much are we paying now for all the rail service the majority of the population doesn't use ? If we're subsidizing transcontinental shipping of food grown in the California deserts with Colorado river water the tax payers subsidize to get to California, that should stop too. Maybe the farms across the country could then compete on a level playing field. ~~~~~~ The Republican Vermonter route faces changes Sunday, September 27, 2009 By MICHAEL McAULIFFE mmcauliffe@repub.com The state this week began taking public comments for an environmental analysis connected to a project that would alter the route of the Vermonter passenger train in Western Massachusetts. The Executive Office of Transportation will accept written comments through Oct. 14. The office has submitted a grant application with the Federal Railroad Administration for $69 million for the project, which qualifies for federal stimulus funds.	Thank you for your comment. Part of the Purpose and Need of the Proposed Project is to increase revenue per train and/or reduce train operation costs, and increase ridership per train. Appendix E of the EA contains the Draft Economic Development Analysis of Passenger Rail in the Knowledge Corridor (July 2009). This report identifies detail regarding population growth, cost benefit ratios and additional ridership potential. Overall, the improved rail service along the Knowledge Corridor is anticipated to provide employment and population growth, with positive economic benefits to Northampton and Greenfield.

Amtrak north-south service in Western Massachusetts is currently provided by the Vermonter, which runs between Washington, D.C., and St. Albans, Vt., and travels through Springfield. The train makes one trip in each direction daily, and in Massachusetts only stops in Springfield and Amherst. The project would reroute the train to its original route along the Connecticut River Line from Springfield to East Northfield. The project includes establishing station stops in Northampton and Greenfield, and a stop would later be added in Holyoke. The route would draw increased ridership and take about 50 minutes travel off a round trip, according to the state, but it would also eliminate the current stop in Amherst. The Connecticut River Line is currently limited to slow-moving freight trains because of the condition of the track. "As with any public comment period, we encourage people ... to make their voice heard," said Colin Durrant, a spokesman for the Executive Office of Transportation. "I would not be surprised if there was a significant amount of comment," said Dana Roscoe, a principal planner with the Pioneer Valley Planning Commission. The commission is involved in a study of the project that includes Amtrak, Pam Am Railways, and the state transportation agencies in Vermont and Massachusetts. The study has included public hearings in Springfield, Northampton and Bellows Falls, Vt., and Roscoe said of the vast majority of comments submitted in connection with the hearings favor rerouting the line.	Comment continued.

As a resident of Greenfield and a frequent driver along the I-91 corridor, I would VERY MUCH like to see the re-routing of the Amtrak Vermonter through Northampton and Greenfield. I would much prefer to ride the train vs. driving to Brattleboro, Bellows Falls, and Northampton and would also use it to visit relatives near White River Junction. Greenfield, Northampton, Brattleboro, and Bellows Falls all have very walkable downtowns and decent bus connection service so having a connecting trains could really facilitate less personal automobile use in the area. I look forward to seeing this project progress. thank you -Garth Shaneyfelt Greenfield, MA	Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

Hello, I want to let you know that I think restoring rail service to the Pioneer Valley is a fantastic idea that I and my family fully support. I hope this project goes through! Sincerely, Karen M Scott, MD	Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.
To whom it may concern, We are writing to support the changes being proposed to the Vermonter Line. We are in agreement with the proposed change of trains traveling through Northampton and Greenfield. With the building of the new transportation center in Greenfield, it only makes sense to do this. It shouldn"t be too much of an inconvenience for Amherst people to travel to Northampton and this change adds another stop in Massachusetts which will benefit the Greenfield area. We also like the fact that this will shorten the St. Albans to Washington D.C. route by 50 minutes. We live in Shelburne and travel to Essex Junction, Vt. to visit family often by the Vermonter and this will be more convenient to not have to travel to Brattleboro or Amherst if heading South. Yours sincerely, Fred Kelley and Pam Parker	Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

Greetings, I would like to voice my support for the Restore Vermonter project (http://www.eot.state.ma.us/knowledgecorridor/). I've lived in Boston for the last seven years but I've yet to explore much of New England beyond eastern Massachusetts, due in part to the lack of attractive car-free transportation options. Any increase in the speed, frequency, and reliability of rail transit in the region would be very welcome to residents such as myself who do not need or want a car. The current rail system's main deterrent to me personally is the low number of trains per day; with as few as one trip per direction per day, trip planning can be very difficult, especially if a direct route is not available and a transfer is required. I've yet to find a time when rail was a viable option for me, and I'd love for that to change. Regards, Josh Hetrick Boston, MA	Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts. Although the Proposed Project does not include expanded service, it does enhance the capacity of the rail line and create potential for future expansion of passenger rail in the Knowledge Corridor. As discussed in Section 1.0 of the EA, the Proposed Project facilitates the expansion of passenger rail service by improving safety, increasing operating speeds for existing freight train traffic and the Vermonter, and enhancing capacity on the rail line to accommodate future increased levels of train traffic.



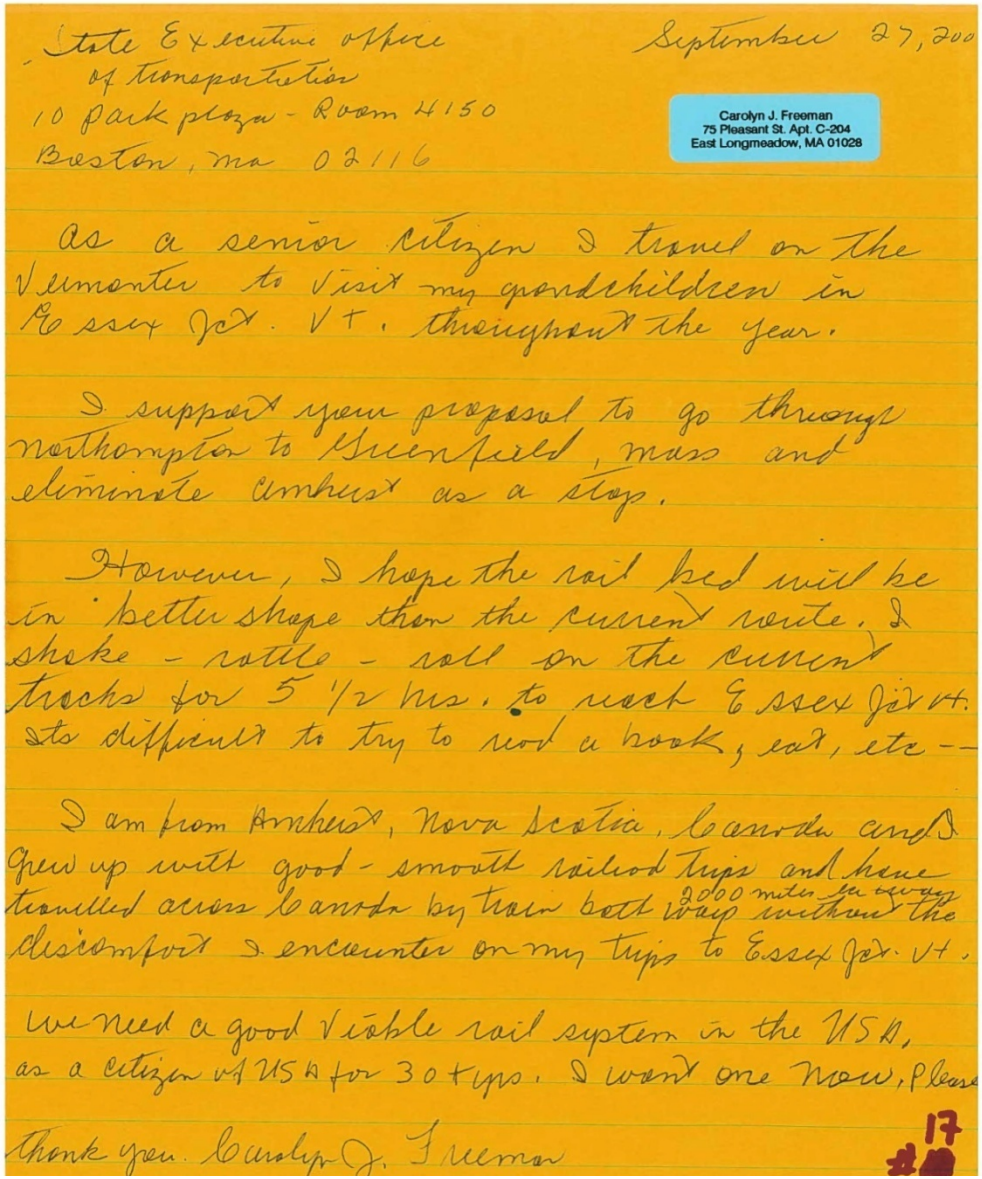
32 Old Brick Rd
Apfld. Ma. 01118
9/20/09

To:
Executive Office
of Transportation
10 Park Plaza
Room 4150
Boston, Ma. 02116

Answering your newspaper
item on the proposed
change of the Vermont
passenger train to Western
Mass. Apfld. would be
an ideal spot. We have many
colleges here A.I.C., W.N.E.C. and
Apfld. College whose students
would make use of this
transportation. We have
a depot here, too.

Thank You
(Mrs.) Rowena A. Lyons

Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.



State Executive office
of transportation
10 park plaza - Room 4150
Boston, ma 02116

September 27, 200

Carolyn J. Freeman
75 Pleasant St. Apt. C-204
East Longmeadow, MA 01028

As a senior citizen I travel on the Vermonter to visit my grandchildren in Essex Jct. Vt. throughout the year.

I support your proposal to go through northampton to Greenfield, mass and eliminate Amherst as a stop.

However, I hope the rail bed will be in better shape than the current route. I shake - rattle - roll on the current tracks for 5 1/2 hrs. to reach Essex Jct Vt. Its difficult to try to read a book, eat, etc --

I am from Amherst, Nova Scotia, Canada and I grew up with good - smooth railroad trips and have travelled across Canada by train both ways (2000 miles in each way) without the discomfort I encounter on my trips to Essex Jct. Vt.

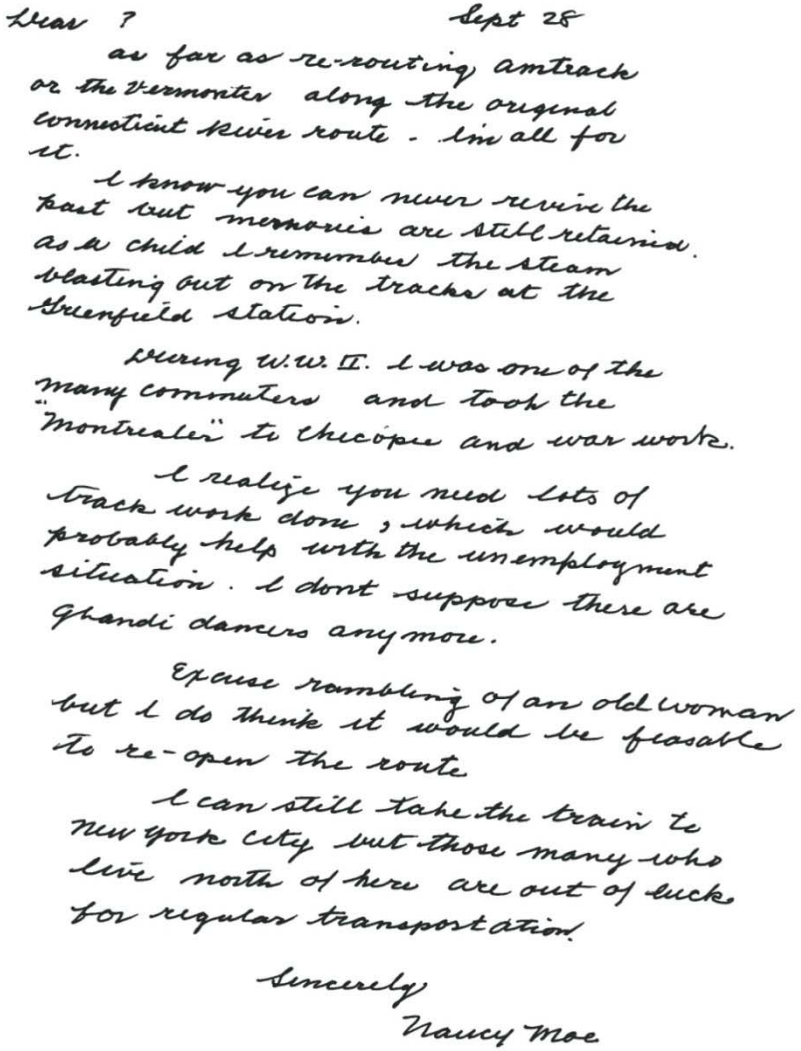
We need a good viable rail system in the USA, as a citizen of USA for 30+ yrs. I want one now, Please

Thank you. Carolyn J. Freeman

17
#1

Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

It is the intent of the Proposed Project to make improvements to the right-of-way including crosstie replacement, rail replacement, rehabilitation of grade crossings, reactivation of passing sidings and portions of double track, upgrading of switches, improvements to signal and communications systems, surfacing and alignment of track, and improvements to bridges and station platforms. These improvements would facilitate the relocation of the Vermonter by improving safety, increasing operating speeds for existing freight train traffic and the Vermonter, and enhancing capacity on the rail line to accommodate future increased levels of train traffic.



Dear ? Sept 28

as far as re-routing amtrack or the vermonter along the original connecticut River route - I'm all for it.

I know you can never revive the past but memories are still retained. as a child I remember the steam blasting out on the tracks at the Greenfield station.

During W.W. II. I was one of the many commuters and took the "Montrealer" to Chicopee and war work.

I realize you need lots of track work done, which would probably help with the unemployment situation. I dont suppose there are Ghandi dancers any more.

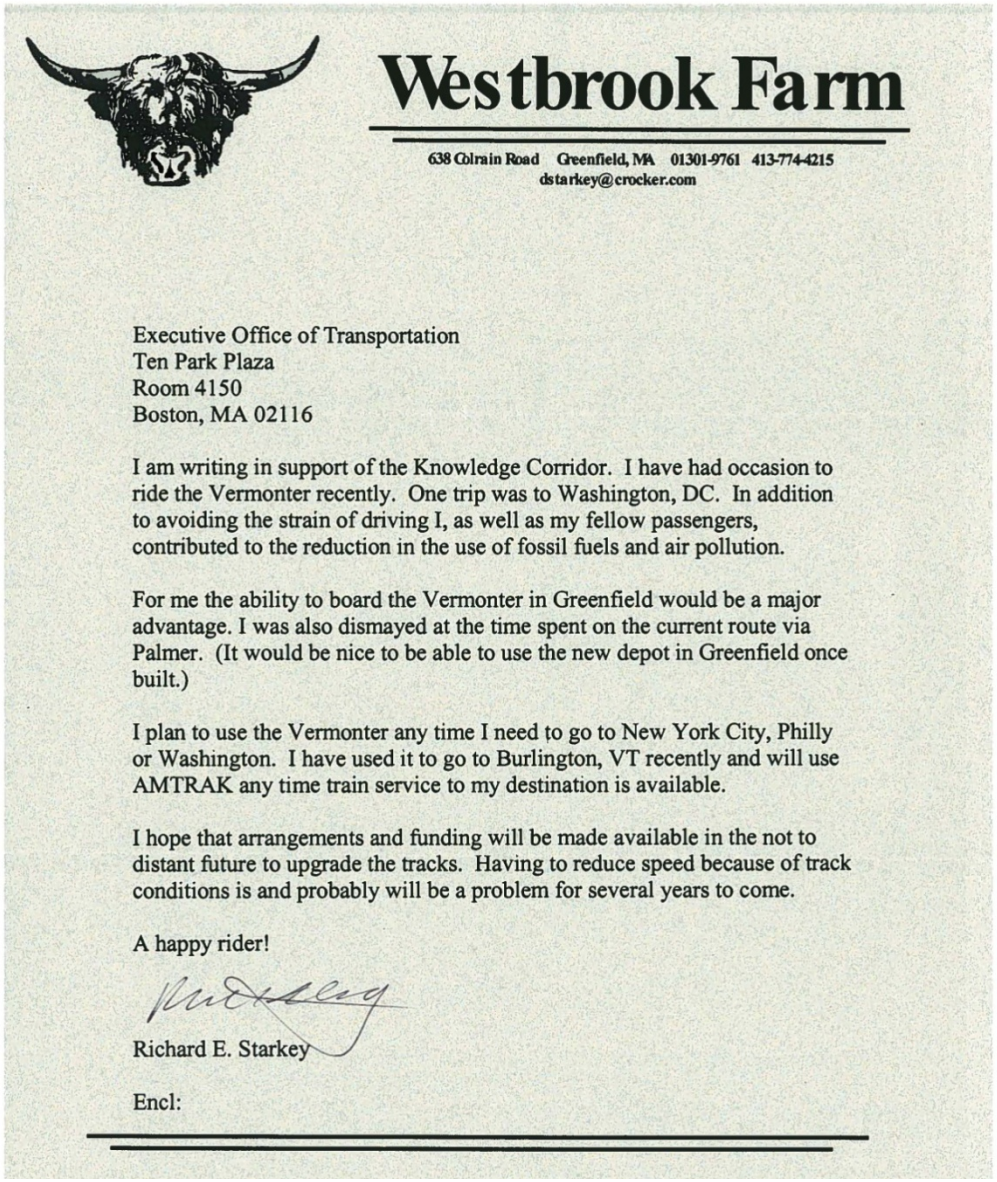
Excuse rambling of an old woman but I do think it would be feasable to re-open the route.

I can still take the train to New York city but those many who live north of here are out of luck for regular transportation.

Sincerely

Nancy Moe

Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.



Westbrook Farm

638 Colrain Road Greenfield, MA 01301-9761 413-774-4215
dstarkey@crocker.com

Executive Office of Transportation
Ten Park Plaza
Room 4150
Boston, MA 02116

I am writing in support of the Knowledge Corridor. I have had occasion to ride the Vermonter recently. One trip was to Washington, DC. In addition to avoiding the strain of driving I, as well as my fellow passengers, contributed to the reduction in the use of fossil fuels and air pollution.

For me the ability to board the Vermonter in Greenfield would be a major advantage. I was also dismayed at the time spent on the current route via Palmer. (It would be nice to be able to use the new depot in Greenfield once built.)

I plan to use the Vermonter any time I need to go to New York City, Philly or Washington. I have used it to go to Burlington, VT recently and will use AMTRAK any time train service to my destination is available.

I hope that arrangements and funding will be made available in the not to distant future to upgrade the tracks. Having to reduce speed because of track conditions is and probably will be a problem for several years to come.

A happy rider!

Richard E. Starkey

Encl:

Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

The elimination of the reverse move at Palmer will shorten travel time and potentially improve the ability to travel to connecting cities such as New York, Washington D.C., and Philadelphia. We appreciate your support in our efforts.

People Informing People THE HAWK EYE
THE HAWK EYE

Governor toots rail's horn

Culver promotes rail expansion, green technology, I-Jobs on southeast Iowa tour.

By CHRISTINIA CRIPPES

ccrippes@thehawkeye.com

The rail lines that cut across the nation carry everything from coal to grain to cars to people.

Gov. Chet Culver, a Democrat, used those multiple-use rail lines Wednesday to multitask. During his southern Iowa tour from Creston to Burlington -- and a brief trip into Illinois -- Culver promoted the state infrastructure I-Jobs program and a renewed focus on green energy, but mostly maintained focus on the state's passenger rail service.

"It's really a two-pronged approach; it's a new concept that we're going to continue to have the longer hauls, the kind of east to west Zephyr-type of service, and we're going to complement that with more of a regional-type approach," Culver said during a BNSF-hosted train ride from Mount Pleasant into Burlington.

Related Images:

Matt Ryerson/The Hawk Eye
Gov. Chet Culver speaks to a crowd Wednesday after making a stop at the Burlington Depot during his train tour, which traveled from Creston to Burlington and made stops along the way in Osceola, Albia, Ottumwa, Fairfield and Mount Pleasant.

He said that will require maintenance and upgrades to the existing system, as well as developing an almost-commuter rail type of service. While the main focus has been on a route from Iowa City to Chicago, Culver said the southern route will not be forgotten.

"It's not going to compete with some other transportation or even rail options; it's just if that's your destination and you want to make a round-tripper, that suddenly is a good option," Culver said. "We've made it very clear that we've got to have both, and the advantage for Burlington and for Mount Pleasant is that as a result of this new refocus, this line, the California-Zephyr line is going to improve."

The first key is improving reliability and increased speed, Culver said.

"That should mean you suddenly get more people that say, 'Wait a second;' instead of flying into a regional hub like Chicago, you suddenly have a better option with the train," Culver said, adding that it is going to take effort to push Iowans into the rail mindset.

Culver has made four trips across the state on the rail lines to promote passenger services.

While some of those improvements -- which includes construction of a new BNSF Railway bridge and new lines to route passengers around the slower-moving coal trains -- are federally funded, others are statewide and across-state-lines initiatives.

Comment Continued.

"We had a very historic Midwestern governors summit in Chicago a couple months ago, and we brought all the federal officials in and we are one of the only regions in the country that was really organized to tell the federal government, essentially we're ready to move," Culver said in Burlington.

By doing their homework, he said the states are more likely to qualify for some of the $8 billion in federal stimulus dollars designated for passenger rail service, including the green line from Iowa City to Chicago route.

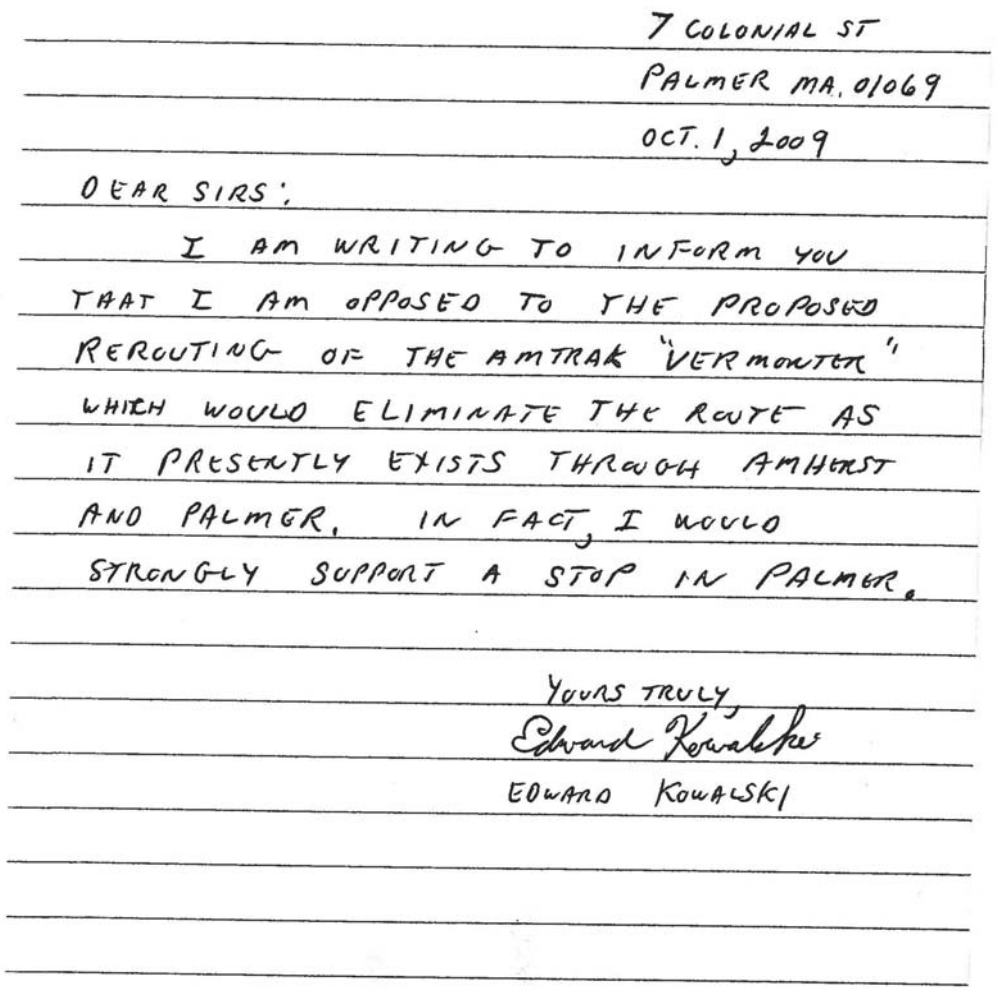
Culver said that green line, and others that may come after it, will use biodiesel and soy lubricant; its conductors will punch paperless tickets; and the depots will be certified as energy efficient.

"That should allow Iowa to stand out even more from the pack, but we are very optimistic and hope we can get that done in the next two to three years," Culver said.

Culver said the stimulus and I-Jobs funds also should help improve depots throughout Iowa, whether they're energy-efficient certified. The Fort Madison depot already received a $1.13 million grant from the $830 million I-Jobs initiative that was approved in the past legislative session to build on the federal stimulus program.

"The first round is out the door, but we hope to be able to do more, especially through some of these depot projects, and that's something I've talked to the local officials about as I'm here today and with Amtrak officials, and so between the federal stimulus money the I-Jobs money, there's never been a better opportunity to get this renovation done," Culver said. "It's like a modern airport; you want to have a modern depot and that investment should help with ridership too."

Comment Continued.



7 COLONIAL ST
PALMER MA. 01069
OCT. 1, 2009

DEAR SIRS:

I AM WRITING TO INFORM YOU THAT I AM OPPOSED TO THE PROPOSED REROUTING OF THE AMTRAK "VERMONTER" WHICH WOULD ELIMINATE THE ROUTE AS IT PRESENTLY EXISTS THROUGH AMHERST AND PALMER. IN FACT, I WOULD STRONGLY SUPPORT A STOP IN PALMER.

YOURS TRULY,
Edward Kowalski
EDWARD KOWALSKI

Thank you for your input. Under the Proposed Project, Amtrak service (e.g. the Vermonter) would no longer be provided in Amherst. Instead, stations would be located in Northampton and Greenfield. Section 3.3.1 of the EA, describes existing bus service in Amherst, Greenfield, and Northampton that would provide connections to the proposed stations.

In addition, the General Plans of Northampton, Greenfield and Amherst identify goals to enhance bus service that will compliment the planned inter-modal hubs and railroad stations for the Proposed Project.

EOT recognizes the interest for passenger service in Palmer. EOT is in the process of a High Speed Rail Study on the "Inland Route" between Boston, Worcester, Springfield and New Haven. This study is expected to develop a Service Development Plan for this portion of the Northern New England High Speed Rail Corridor. The “Inland Route” passes through Palmer, and a new station in Palmer will be specifically analyzed in the study. EOT also submitted a Track 1b grant application for Preliminary Engineering and Environmental Work for double tracking the Inland Route from Springfield to Worcester including Palmer. This application also anticipates a potential station in Palmer.

18 Evergreen Drive
East Longmeadow, MA 01028

October 5, 2009

State of Massachusetts
Executive Office of Transportation
10 Park Plaza, Room 4150
Boston, MA 02116

Dear Sir:

I am writing to comment on your proposal to re-route the Amtrak Vermonter and provide direct rail service between Greenfield, Northampton, and Northeast Corridor cities.

As a frequent Amtrak rider, for both business and personal trips, I appreciate the convenience of traveling to New York and Philadelphia without the stress of traffic jams in New York City and along I-95. I support your efforts to extend this convenience to passengers along the upper Connecticut River Valley.

At the same time, I am concerned that all the time, effort, and money to accomplish the re-routing will be a wasted effort unless the new rail service is well patronized. You may remember that the last time Massachusetts sought enhanced Amtrak service, the resulting Inland Route service was not well patronized and had to be abandoned by Amtrak. Before spending the taxpayers' money, I think it is critical for you to be very confident that enough passengers will use the new service to make the effort worthwhile.

My suggestion is for you to conduct a Marketing Survey in Northampton, Holyoke, and Greenfield to identify potential riders, along with their potential destinations and the purpose of their trips. The rail service should then be scheduled to meet the needs of these potential passengers.

For example, let us assume a large group of potential riders was identified who would travel from Northampton to New York, with the purpose of their trips identified as attending a concert, a Broadway show, a hockey or basketball game, a night baseball game, or night-clubbing. These are evening activities, so the needs of these potential passengers would be met by your current plan to re-route the Vermonter. On the other hand, assume the Marketing Survey identified a large group of potential riders who would travel from Greenfield to New York for a business meeting, or to attend a convention or trade show, or a museum or day baseball game, or for shopping. These are daytime activities, and to meet the needs of these passengers, it would make more sense to leave the Vermonter alone and extend the run of an early morning run, such as # 495, to originate in Greenfield instead of Springfield. Return service to Greenfield could be provided by extending the run of an evening train, such as # 494. No new equipment would be required, as this train set currently idles overnight in Springfield.

Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

More efficient operation and faster travel time will improve the ability to travel to connecting cities such as New York, Washington D.C., and Philadelphia. We appreciate your support in our efforts.

Appendix E of the EA contains the Draft Economic Development Analysis of Passenger Rail in the Knowledge Corridor (July 2009). This report identifies detail regarding population growth, cost benefit ratios and additional ridership potential for enhanced rail service in the Knowledge Corridor.

It may sound obvious that a train should be scheduled to meet the needs of its potential passengers, but this rule has been ignored over and over again by Amtrak. Earlier, I mentioned the ill-fated Inland Route service. Back in the 1980's, Amtrak assumed most passengers would be travelling to New York for daytime activities, so they scheduled a 7 AM departure from Boston and a 5 PM return departure from New York. Amtrak forgot that 7 of the 8 cities along the Inland Route between New Haven and Boston already had frequent Amtrak service to New York, with no benefit from the addition of Inland Route service. Was Amtrak expecting to fill the train with only the passengers who boarded at Worcester? I suspect that if a proper Marketing Survey had been conducted, a significant market for Boston-bound passengers would have been identified, since 6 of the 8 Inland Route cities had no rail service to Boston, and the other 2 had no service scheduled to permit daytime Boston activities. I believe that if the Bay State had been scheduled to leave New York at 6 AM and Boston at 6 PM, the train would have been well patronized and would still be running today. I am sorry to say we don't need to look back 20 years to find examples of rail scheduling that does not meet the needs of riders. Earlier this year the Piedmont Rail Coalition and the Virginia DOT worked to establish early morning rail service from Lynchburg and Charlottesville to Washington, DC. They obtained funding, and a commitment from Amtrak for the new train to depart Lynchburg at 5 AM and arrive in Washington at 8:40. When the service actually began last week, Amtrak had altered the schedule to run 3 hours later. An angry US Representative Tom Perriello wrote Amtrak that " the Lynchburg departure at 7:43 and Washington arrival at 11:20 will effectively eliminate day travel for business purposes." (Charlottesville Daily Progress 8-28-09) I am hopeful that your grant application will be approved, and that rail passenger service can be restored to Greenfield and Northampton. I just don't want taxpayer money to be wasted. It's bad enough that taxpayer money will be used to repair the Guilford Railroad's track and roadbed, which is clearly Guilford's responsibility under the agreements signed by the B&M (and all other passenger railroads) with Amtrak back in the 1970's. It would be even worse if the time, money, and effort was expended, and the passengers who boarded the train every day could fit in one bus. This is why I urge you to conduct a Marketing Survey, and then insist in your negotiations with Amtrak that the train service is scheduled to meet the actual needs of the potential passengers. Good luck with this project Peter Munk Peter Munk	As identified in Section 4.0, Coordination, the project team closely coordinated with local government, stakeholders and the public through meetings and the formation of a Technical Advisory Committee for the Proposed Project. The TAC is composed of advisors to the project, including railroads, transportation providers, political representatives, government agencies, and major businesses. The input resulting from the coordination and information sharing process was used to develop alternatives and analyze potential impacts for the Proposed Project. Rail service scheduling is a complex undertaking, and must consider rail system capacity, freight and passenger rail demands, allowable safe operating speeds, and other factors extended across multiple states. Passenger needs in Northampton and Greenfield are one of the many factors that will be considered in scheduling for the Vermonter on the new route.

October 8, 2009

56 Nassau Drive
Springfield, MA 01129-1411

Executive Office of Transportation
Vermonter Route
10 Park Plaza, Room 4150
Boston MA 02116

Dear Mr. J. Aloisi

I am writing to you in regard of a new and much needed route for the Vermonter leaving from Springfield MA to Vermont and return. This would be such a great improvement for this line. As it now stands we go from Springfield to Palmer and wait for up to 45 minutes until they switch the rails, and we get an ok from CNX to proceed to Amherst.

I ride this train often because I do not want to drive alone to Waterbury-Stowe Vt. I could make the trip in much less time by car.

Going by train saves gas and wear and tear on my car, which in turn also helps the environment.

People want and need alternative forms of transportation. This rail line both going north and south would be the beginning of bringing this one up to date.

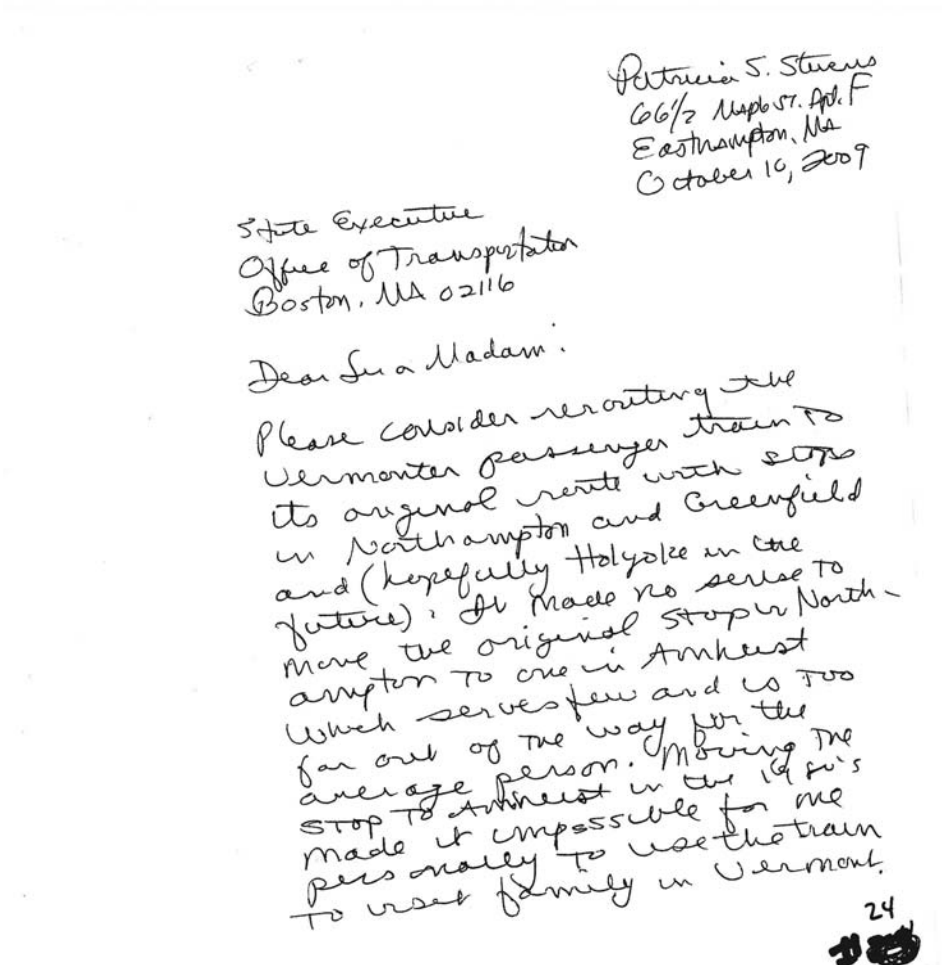
This country *must* improve its pubic transportation system if it's going to start to solve the gas problem. If this goes through and cuts time off the trip, I envision many more people using it. In the winter it could be advertised as a way skiers could travel without worrying about inclement weather on the roads.

Now that we have a President that understands the need for public transpiration, we ought to stop talking and get the plan up and moving!

Very truly yours,

Govannina A. Nichting

Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.



Patricia S. Stivers
66½ Maple St. Apt. F
Easthampton, MA
October 10, 2009

State Executive
Office of Transportation
Boston, MA 02116

Dear Sir or Madam:

Please consider rerouting the Vermonter passenger train to its original route with stops in Northampton and Greenfield and (hopefully Holyoke in the future). It made no sense to move the original stop in Northampton to one in Amherst which serves few and is too far out of the way for the average person. Moving the STOP TO Amherst in the 1970's made it impossible for me personally to use the train to visit family in Vermont.

24

Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

Table G-2 Agency Comments and Responses

CITY OF NORTHAMPTON
Mayor Mary Clare Higgins
City Hall, 210 Main Street - Room 12
Northampton, MA 01060-3199
(413) 587-1249 Fax: (413) 587-1275

September 28, 2009

James Aloisi, Secretary
Executive Office of Transportation and Public Works
10 Park Plaza, Room 4150
Boston, MA 02116

Attn: Timothy Doherty

RE: Environmental Assessment for the Knowledge Corridor - Restore Vermonter Project

Dear Secretary Aloisi:

On behalf of the City of Northampton, I offer the following comments on the Environmental Assessment for the Knowledge Corridor Restore the Vermonter Project.

The project has minimal environmental impacts and many positive economic and environmental benefits to the region. The project will:

- Reuse and improve existing rail infrastructure rather than add new rail lines;
- Reduce travel times and increase ridership;
- Result in reduced vehicle use, reduced energy consumption, reduced greenhouse gas production, and improved air quality;
- Provide alternative transportation within the region and to major metropolitan centers outside the region;
- Support the regional economy by making employment centers more accessible;
- Promote development in urban centers where it will have access to rail and bus transportation as well as other services thereby promoting smart growth development;
- Strengthen the Knowledge Corridor partnership with Connecticut and developing regional partnerships with Vermont, thereby strengthening our regional economy and raising our national profile;
- Provide alternative transportation access for visitors to our region providing an alternative to the automobile;
- Strengthen the regional public transit system and create opportunities for more cross connections between bus and rail; and
- Enhance freight rail use with track upgrades, which will serve the region's manufacturers and promote greater efficiency in freight transportation; and
- Improve safety along the rail line.

The City of Northampton fully supports this project and stands ready to assist in making the project a success.

Sincerely,

MARY CLARE HIGGINS
Mayor

Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

FRANKLIN COUNTY CHAMBER OF COMMERCE
395 Main Street, PO Box 898 - Greenfield MA 01302-0898
PHONE: 413-773-5463 FAX: 413-773-7008
www.franklincc.org

October 9th, 2009

Lionel Lucien, Manager of Public Private Development Unit
Massachusetts Executive Office of Transportation
10 Park Plaza, Room 4150
Boston, MA 02116

Re: Support of Grant Application – Vermonter Project

Dear Mr. Lucien,

The Board of Directors of Franklin County Chamber of Commerce strongly recommends that passenger rail service be restored to the Knowledge Corridor as described in the proposed Connecticut River Line Improvements and the Vermonter Project. The lack of access to regional rail passenger transportation in Greenfield and the surrounding towns is not conducive to economic growth, and accessible rail service would greatly improve employees' ability to travel to centers of employment perhaps even in the future commute to their work sites, as well as open new opportunities for tourism to this area from the Metropolitan New York area and beyond.

Currently eight buildings in the downtown core of Greenfield being restored and put into reuse, the proposed intermodal transit center offers our residents and businesses new options and efficiencies. The transit center facility is near the construction stage and located on the Pan Am Southern rail line. It could easily accommodate the interface between train passengers, motor coaches and local buses.

We offer our support to this project for all the reasons stated in the Vermonter Project Grant Application – economic revitalization, job creation, improved air quality, increasing mobility and reducing vehicular traffic congestion. This change is important to development and the future of Greenfield and Franklin County.

Very truly yours,

Eric Nelson, Board Chair

Cc Maureen Mullaney - Franklin Regional Council of Governments, Transportation & GIS Program Manager

Franklin County Chamber of Commerce is a membership organization dedicated to strengthening and sustaining economic and civic vitality in our region.

Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

FRANKLIN REGIONAL COUNCIL OF GOVERNMENTS

425 Main Street • Greenfield, Massachusetts 01301
Telephone 413-774-3167 • Fax 413-774-3169 • www.frcog.org
Executive Director • Linda Dunlavy

October 14, 2009

Lionel Lucien, Manager of Public Private Development Unit
Massachusetts Executive Office of Transportation
10 Park Plaza, Room 4150
Boston, MA 02116

Re: Knowledge Corridor – Restore Vermonter Project Environmental Assessment

Dear Mr. Lucien:

On behalf of the Franklin Regional Planning Board I am pleased to offer comments on the Environmental Assessment for the restoration of the Vermonter passenger rail service back to the Connecticut River Line. This move, along with the associated track upgrade, will allow faster passenger rail service between New Haven; Connecticut and St. Albans, Vermont; return passenger rail service to Franklin County; improve freight transport possibilities; and set the stage for potential commuter rail opportunities along the entire corridor in the future.

In addition, this move supports and enhances significant public and private investment in downtown Greenfield. Currently under design, the new Franklin Regional Transit Center is being developed adjacent to the Connecticut River Line tracks and will have the ability for Amtrak service to stop at the facility. It will be operational by January, 2012. Further, the renovation and reuse of eight buildings adjacent to the new Transit Center that is currently underway will bring new business and residential options and opportunities for economic development in the area. These efforts are significantly enhanced by the multimodal transportation opportunities that relocating the Vermonter brings.

The Franklin Regional Planning Board fully supports the relocation of the Vermonter service back to the Connecticut River Line. After reviewing the Environmental Assessment, the following specific comments are offered:

1. Several typos are contained in the first section of the report referring to East Northfield, VT. East Northfield is located in Massachusetts. There is also a reference to East Northampton, which appears to be mistaken for East Northfield.
2. A more complete explanation of the "Knowledge Corridor" should be included. The "Knowledge Corridor" is a major initiative to utilize the educational assets of the region

Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

The following changes have been made as a result of your specific input.
Comment # 1: Text of the Final EA has been changed to reflect input.
Comment # 2: Text further explaining the origin of the Knowledge Corridor has been added to the existing text in Section 1.3 of the Final EA.

and enhance technological industries, both existing and start-up, and should be more completely explained.

3. Section 1.4 does not include any information on the need/benefit of inter-city rail traffic, for example service between Springfield and Greenfield, or Greenfield and Northampton, etc. There appears to be significant benefit from this type of service, and it should be further discussed.

The potential return of passenger rail service to Franklin County and downtown Greenfield will have significant benefits for the region's transportation network and economic development opportunities. The environmental consequences of this move, as outlined in the Environmental Assessment, appear to be minimal since the track already exists and freight transport has continuously operated on the line.

For these many reasons, the Franklin Regional Planning Board respectfully urges the Federal Transit Administration to approve the Environmental Assessment and move forward with steps to relocate the Vermonter service back to the Connecticut River Line Tracks.

Sincerely,

Tom Miner, Chair
Franklin Regional Planning Board

C: Peggy Sloan, FRCOG
Maureen Mullaney, FRCOG
Guy Bresnahan, EOT

Comment #3: EOT agrees there are significant benefits in providing enhanced intercity rail service. The Proposed Project's restores the Vermonter to its original route along the Connecticut River and would include station stops in Greenfield and Northampton, thereby providing increased intercity rail service for these areas. In addition, the Proposed Project includes improvements to the rail line that enhance capacity on the rail line to accommodate future increased levels of train traffic.

Catalyst for Regional Progress

PVPC

Timothy W. Brennan, Executive Director

October 14, 2009

James Aloisi, Secretary
Executive Office of Transportation
10 Park Plaza, Room 4150
Boston, Massachusetts 02116

Attention: Timothy Doherty

Reference: Review Comments on the Environmental Assessment for the Proposed Knowledge Corridor – Restore Vermonter Project

Dear Secretary Aloisi:

The Pioneer Valley Planning Commission (PVPC) has the following review comments for the above-cited project. The proposed project involves an upgrade to the Pan Am Southern owned Connecticut River line allowing passenger rail service to be returned to this corridor. The PVPC has long been interested in restoration of this rail service and in 2007 we received a federal grant to study the feasibility of this project. Results of this study found construction of this project would be a great asset to the Pioneer Valley region as a transportation project as well as an economic development project.

This project is currently included as part of the Transportation Improvement Program (TIP) for the Pioneer Valley Region as adopted by the voting members of our area's Metropolitan Planning Organization (MPO). Construction of this project would return passenger rail service to downtown Holyoke as well as Northampton and the Franklin County town of Greenfield. Accordingly, the PVPC fully supports this important transportation improvement project.

Thank you for the opportunity to offer our comments on this proposed project.

Sincerely,

Timothy W. Brennan
Executive Director

Thank you for your comment. The purpose of this project is to enhance mobility in the region and the Knowledge Corridor by improving the viability and long-term sustainability of passenger rail service in the study area. We appreciate your support in our efforts.

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

October 9, 2009

Melissa Elefante DuMond
Federal Railroad Administration
US Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

RE: Knowledge Corridor-Restore Vermonter Pan Am Southern Railroad Restoration, Springfield to Northfield, MA. MHC # RC.47056.

Dear Ms. DuMond:

Staff of the Massachusetts Historical Commission (MHC), office of the State Historic Preservation Officer, have reviewed the determination of effect from the Federal Railroad Administration (FRA), the Project Notification Form (PNF) and additional information, received September 24, 2009, for the project referenced above. At this time, the MHC is unable to concur with FRA's determination of no effect for the project and requires additional information.

FRA's determination of the area of potential effect for the project is limited to the existing right-of-way of the "Knowledge Corridor", but it is not clearly indicated that the area of potential effect includes the proposed railroad stations. MHC notes that project information provided in the PNF indicates that new construction of the Greenfield Station is proposed at the former Toyota Center at Olive Street in Greenfield, in conjunction with the development of a "future inter-modal hub" by the City of Greenfield. The MHC has previously reviewed the proposed Franklin County Regional Transit Center (FCRTC) (MHC # RC.41043) in 2006 through 2008 at this location in consultation with the Federal Transit Administration (FTA).

For the FCRTC project, MHC provided an opinion that the existing structure at 12 Olive Street did not meet the Criteria of Eligibility (36 CFR 60) for listing in the National Register of Historic Places, and requested the opportunity to review and comment on proposed project plans and building elevations for the Transit Center. The proposed project is immediately adjacent to the Main Street Historic District (MHC # GRE.A), listed in the State and National Registers of Historic Places. MHC recommends that FRA coordinate with FTA to provide MHC with scaled project plans and building elevations for the Transit Center for review and comment.

Review of the Inventory of Historic and Archaeological Assets of the Commonwealth determined that the existing Union Station (MHC # NTH.2148) in Northampton, identified as the Northampton Railroad Station in FRA's determination, is an inventoried historic property contributing to the historic characteristics of the Northampton Downtown Historic District (MHC # NTH.A), listed in the State and National Registers of Historic Places. The proposed station platform upgrades at Railroad Street in Northampton, while in keeping with maintaining the original purpose of train access at that location, should take into account the historic characteristics of the Richardsonian architectural significance of Union Station in design and construction of the

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Project plans and elevations for the Greenfield and Northampton Stations have not yet been produced. Section 106 allows the use of a Programmatic Agreement when effects on historic properties cannot be fully determined prior to an undertaking (36 CFR 800.14(b)(1)(ii)).

The FRA is currently developing a Programmatic Agreement by and among the FRA, MHC, and EOT. The Programmatic Agreement will describe the Project, identify the parties involved, and outline steps that would be undertaken by the FRA and consulting parties to complete the Section 106 process for this Project.

Further, FRA commits that there will be no Project-related construction initiated on the Northampton platform or Greenfield station until the FRA's responsibilities under the Section 106 process of the National Historic Preservation Act, 16 U.S.C. 470F (NHPA) have been satisfied.

platform and canopy. Please provide to the MHC scaled proposed condition plans and elevations for the platform and canopy for review and comment.

MHC notes that the identification documentation include photocopies of archaeological site forms and USGS locus maps from the Inventory of Historic and Archaeological Assets of the Commonwealth. This data contains highly sensitive archaeological site locational information, including human burials, and is not a public record (36 CFR 800.6(a)(5); 800.11(c); Massachusetts General Laws Chapter 9, sections 26A(1) & 27(C)). Please remove all sensitive archaeological site locational information from any project documents intended for public review. Any documentation prepared with this information should be prominently labeled "Confidential. Not for Public Release", and the distribution strictly controlled. Please consult with the MHC prior to disseminating this information.

These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800) and M.G.L Chapter 9, Sections 26-27C (950 CMR 71). If you have any questions or require additional information, please contact Jonathan K. Patton at this office.

Sincerely,

Brona Simon

Brona Simon
State Historic Preservation Officer
Executive Director
State Archaeologist
Massachusetts Historical Commission

xc: Richard H. Doyle, Regional Administrator, FTA Region 1
Thomas Cahir, Deputy Secretary of Rail and Intermodal Programs, EOT
Pioneer Valley Planning Commission
Greenfield Historical Commission
Northampton Historical Commission
Epsilon Associates, Inc.